

PATENT ABSTRACTS OF JAPAN

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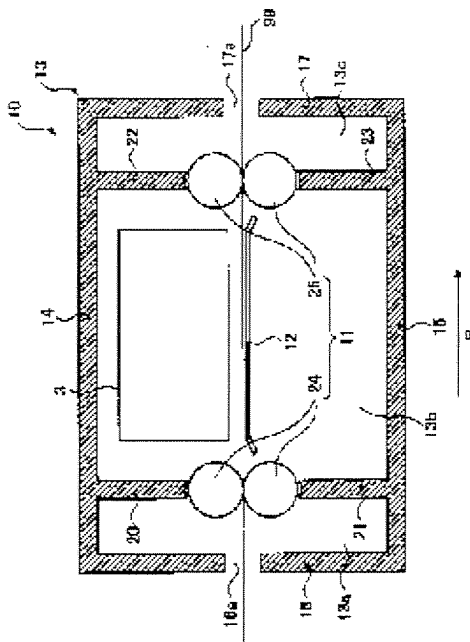
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(54) INKJET PRINTER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an inkjet printer which can suppress spreading of ink drops after the ink drops hit.

SOLUTION: The inkjet printer 1 has a chamber structure 10 with a chamber 13b inside, a carriage 3 arranged in the chamber structure 10, and an inert gas supply means for supplying an inert gas to the chamber 13b. The carriage 3 reciprocates in a horizontal scanning direction A. Heads 4, 4 and the like for discharging ink drops highly reactive to oxygen towards a recording medium 99 are set at the carriage 3, and an UV light source 5 is set between the heads 4 and 4. An oxygen concentration in the chamber 13b is decreased by supplying the inert gas to the chamber 13b, thereby preventing an inhibition of curing of ink drops which land on the recording medium 99.



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CLAIMS

[Claim(s)]

[Claim 1]An ink-jet printer comprising:

A head which carries out the regurgitation towards a recording medium from on a recording medium by making into an ink droplet active light hardenability ink hardened by the exposure of active light.

An irradiation means which irradiates with active light an ink droplet which reached a recording medium, and a gas supply means by which an ink droplet which reached a recording medium supplies inertness inactive gas to a part irradiated by said irradiation means to active light hardenability ink.

[Claim 2]The ink-jet printer according to claim 1 which possesses further a sealing means which shuts up inactive gas with which an ink droplet which reached a recording medium was supplied to a part irradiated by said irradiation means by said gas supply means.

[Claim 3]Said sealing means is a surrounding body which surrounds a part where an ink droplet which reached a recording medium is irradiated by said irradiation means, The ink-jet printer according to claim 2, wherein inside of said surrounding body serves as an inert gas atmosphere because said gas supply means supplies inactive gas in said surrounding body.

[Claim 4]An ink-jet printer comprising:

A head which carries out the regurgitation towards a recording medium from on a recording medium by making into an ink droplet active light hardenability ink hardened by the exposure of active light.

An irradiation means which irradiates with active light an ink droplet which reached a recording medium, and a deoxidation means by which an ink droplet which reached a recording medium removes oxygen from a part irradiated by said irradiation means.

[Claim 5]The ink-jet printer according to claim 4 with which an ink droplet which reached a recording medium possesses further a surrounding body which surrounds a part irradiated by said irradiation means.

[Claim 6]The ink-jet printer according to claim 3 or 5, wherein a ballistic trajectory of an ink droplet after being breathed out by said head until it reaches a recording medium consists in said surrounding body.

[Claim 7]The ink-jet printer according to claim 3, 5, or 6, wherein said head and said irradiation means are allotted in said surrounding body.

[Claim 8]A passing mouth which leads inside and outside is provided in said surrounding body, and it is provided so that two rollers by which the placed opposite was carried out mutually may plug up said passing mouth, The ink-jet printer according to claim 3, 5, 6, or 7, wherein a recording medium inserted into said two rollers passes said passing mouth by rotation of said two rollers.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the ink-jet printer which carries out image formation to a recording medium by carrying out the regurgitation of the ink to a recording medium.

[0002]

[Description of the Prior Art]In recent years, many image formation methods using the ink-jet printer as an image formation method which can form a picture simple and cheaply are adopted. An ink-jet printer moves recording media, such as paper and a resin film, to a vertical scanning direction intermittently, and when the recording medium has stopped, it moves a head to the scanning direction which becomes right-angled with a vertical scanning direction on a recording medium. And while the head is moving to the scanning direction, an ink-jet printer carries out the regurgitation of the ink droplet to a recording medium from a head with a piezo-electric element or a heater. A picture is formed in a recording medium by operation of such an ink-jet printer.

[0003]There is active light hardenability ink hardened by the exposure of active light called ultraviolet rays as ink used for an ink-jet printer. The monomer or oligomer from which active light hardenability ink serves as paints and a precursor of a high molecular compound, for example, It is formed including the photopolymerization initiator etc. which generate a radical (active species) by active light energy (mainly ultraviolet energy), and advance the crosslinking reaction or the polymerization reaction of a monomer or oligomer by this radical, and hardens by the crosslinking reaction or the polymerization reaction by exposure of active light. The printer which carries out image formation in such active light hardenability ink is a low odor comparatively compared with the printer which carries out image formation in solvent system ink.

It is observed in recent years at the point which can perform record to a recording medium without ink absorbency.

[0004]

[Problem(s) to be Solved by the Invention]By the way, although a radical occurs in the initiation reaction of a photopolymerization initiator, a radical will be consumed at oxygen in the air reacting that it is radical, and the activity of active light hardenability ink will decrease by oxygen. Therefore, the ink droplet of active light hardenability ink will spread and spread on a recording medium, without hardening, after reaching a recording medium. It follows and a high-definition picture cannot be acquired. Especially, when a recording medium is a resin film, the breadth speed of an ink droplet is quick, and the actual condition is that carrying out image formation to a resin film in active light hardenability ink is not put in practical use.

[0005]In order that active light hardenability ink may harden certainly in the air, enlarging ultraviolet energy is also considered, but if ultraviolet energy is enlarged, a recording medium deteriorates easily and the recording medium of weak construction material cannot be used for ultraviolet rays.

[0006]Then, the technical problem of this invention is an ink-jet printer which can stop the breadth of the ink droplet after an ink droplet reaches the target. It is providing the ink-jet printer which is stabilized also

to what kind of kind of recording medium, and can form a high definition picture in active light hardenability ink.

[0007]

[Means for Solving the Problem]In order to solve the above technical problem, an ink-jet printer concerning the invention according to claim 1 is provided with the following.

A head which carries out the regurgitation towards a recording medium from on a recording medium by making into an ink droplet active light hardenability ink hardened by the exposure of active light.

An irradiation means which irradiates with active light an ink droplet which reached a recording medium.

A gas supply means by which an ink droplet which reached a recording medium supplies inertness inactive gas to a part irradiated by said irradiation means to active light hardenability ink.

[0008]In the invention according to claim 1, an ink droplet of active light hardenability ink is breathed out by recording medium by a head, and if an ink droplet reaches a recording medium, it will be irradiated with it by irradiation means at active light. Since inactive gas is supplied to a part where an ink droplet which reached a recording medium is irradiated by irradiation means by gas supply means, an oxygen density around ink falls. Therefore, by oxygen, an ink droplet which reached the target does not produce hardening inhibition, and does not enlarge ultraviolet energy, but also hardens ** certainly on a recording medium. Therefore, an ink droplet does not spread on a recording medium, but since a path of an ink droplet does not become large, a high definition picture is formed in a recording medium. In particular, even if a recording medium is the construction material in which an ink droplet called a resin film spreads easily, since an ink droplet hardens certainly, image formation can be performed also to a recording medium of such construction material.

[0009]By the way, active light hardenability ink contains a photopolymerization initiator fundamentally, a radical occurs in an initiation reaction of a photopolymerization initiator, and ozone occurs at this radical reacting to oxygen. However, in this invention, since the oxygen density around an ink droplet which reached the target is very low, a reaction of a radical and oxygen does not arise and ozone does not occur. Therefore, this invention does so an effect that generating of an ozone smell can also be suppressed. Since ultraviolet energy is not enlarged but an ink target also hardens ** certainly, a picture can also be formed in a recording medium of construction material which deteriorates easily in ultraviolet rays.

[0010]The invention according to claim 2 possesses further a sealing means which shuts up inactive gas with which an ink droplet which reached a recording medium was supplied to a part irradiated by said irradiation means by said gas supply means in the ink-jet printer according to claim 1.

[0011]Since inactive gas is confined in a part where an ink droplet which reached the target is irradiated by irradiation means in the invention according to claim 2 by sealing means, a decreasing rate of an oxygen density of the part is dramatically high. Therefore, an ink droplet which reached the target does not produce hardening inhibition by oxygen, but does not enlarge ultraviolet energy but also hardens ** certainly on a recording medium. Therefore, an ink droplet does not spread on a recording medium, but it follows and a high definition picture is formed in a recording medium. Since an ink droplet hardens certainly, image formation can be performed also to a recording medium of construction material with which an ink droplet called a resin film spreads easily. Since ultraviolet energy is not enlarged but an ink target also hardens ** certainly, a picture can also be formed in a recording medium of construction material which deteriorates easily in ultraviolet rays. Since an oxygen density around an ink droplet which reached the target falls, a reaction of a radical and oxygen does not arise, and ozone does not occur, but generating of an ozone smell can also be suppressed. The sealing means does not close inactive gas thoroughly in an impact part, and they may be various things called a screen with a closure operation, and it may intercept it so that the open air may not go into an impact part.

[0012]An ink-jet printer concerning the invention according to claim 4 is provided with the following.

A head which carries out the regurgitation towards a recording medium from on a recording medium by making into an ink droplet active light hardenability ink hardened by the exposure of active light.

An irradiation means which irradiates with active light an ink droplet which reached a recording medium.

A deoxidation means by which an ink droplet which reached a recording medium removes oxygen from a part irradiated by said irradiation means.

[0013]In the invention according to claim 4, since oxygen is removed from a part where an ink droplet which reached the target is irradiated by irradiation means by deoxidation means, an ink droplet which reached the target does not produce hardening inhibition by oxygen, but it does not enlarge ultraviolet energy but ** also hardens it certainly on a recording medium. Therefore, an ink droplet does not spread on a recording medium, but it follows and a high definition picture is formed in a recording medium. Since an ink droplet hardens certainly, image formation can be performed also to a recording medium of construction material with which an ink droplet called a resin film spreads easily. Since ultraviolet energy is not enlarged but an ink target also hardens ** certainly, a picture can also be formed in a recording medium of construction material which deteriorates easily in ultraviolet rays. Since an oxygen density around an ink droplet which reached the target falls, a reaction of a radical and oxygen does not arise, and ozone does not occur, but generating of an ozone smell can also be suppressed.

[0014]In the ink-jet printer according to claim 2, the invention according to claim 3 said sealing means, Inside of said surrounding body serves as an inert gas atmosphere because an ink droplet which reached a recording medium is a surrounding body which surrounds a part irradiated by said irradiation means and said gas supply means supplies inactive gas in said surrounding body.

[0015]The invention according to claim 5 possesses further a surrounding body in which an ink droplet which reached a recording medium surrounds a part irradiated by said irradiation means in the ink-jet printer according to claim 4.

[0016]In the invention according to claim 3 or 5, it is irradiated with an ink droplet which reached a recording medium in a surrounding body by ultraviolet rays from an irradiation means. Here, an oxygen density of a surrounding body hurts very low, an ink droplet does not produce hardening inhibition, and also a reaction of a radical and oxygen does not arise and ozone does not occur.

[0017]A ballistic trajectory of an ink droplet after the invention according to claim 6 is breathed out by said head in the ink-jet printer according to claim 3 or 5 until it reaches a recording medium consists in said surrounding body.

[0018]In the invention according to claim 6, a ballistic trajectory of an ink droplet from a head to a recording medium consists in a surrounding body, and since the oxygen density in a surrounding body is very low, during flight, an ink droplet adheres oxygen or does not contain it. Therefore, an ink droplet is certainly hardened, even if ultraviolet rays glare, after reaching the target.

[0019]As for the invention according to claim 7, in the ink-jet printer according to claim 3, 5, or 6, said head and said irradiation means are allotted in said surrounding body.

[0020]In the invention according to claim 7, since a head and an irradiation means are allotted in a surrounding body, an ink-jet printer is simplified and miniaturized.

[0021]In the ink-jet printer according to claim 3, 5, 6, or 7 the invention according to claim 8, A passing mouth which leads inside and outside is provided in said surrounding body, it is provided so that two rollers by which the placed opposite was carried out mutually may plug up said passing mouth, and a recording medium inserted into said two rollers passes said passing mouth by rotation of said two rollers.

[0022]In the invention according to claim 8, a recording medium is carried in in a surrounding body through a passing mouth, or it is taken out out of a surrounding body. Here, an ink droplet which pumping of a gas in a surrounding body and the gas besides a surrounding body was carried out through a passing mouth, and an oxygen density in a surrounding body might rise, therefore reached the target may produce hardening inhibition. However, in the invention according to claim 8, since a passing mouth is closed by two rollers, substitution of a gas the inside of a surrounding body and besides a surrounding body does not arise, and an ink droplet which reached the target does not produce hardening inhibition.

[0023]

[Embodiment of the Invention]A drawing is used for below and the concrete mode of this invention is explained to it. However, the scope of an invention is not limited to the example of a graphic display.

Drawing 1 is a perspective view showing the important section of the ink-jet printer 1, and drawing 2 is a bottom view showing the carriage 3 with which the ink-jet printer 1 is equipped. Drawing 3 is the drawing in which the chamber structure 10 with which the ink-jet printer 1 is equipped was shown, and is the fragmentary sectional view seen and shown in the scanning direction A of drawing 1.

[0024]The ultraviolet curing nature ink which has the character which hardens the ink-jet printer 1 by the exposure of the ultraviolet rays as active light. (it is hereafter called "UV ink".) -- it breathes out towards the recording medium 99 as a drop (henceforth an "ink droplet"), and image formation is performed to the recording medium 99 by performing UV irradiation after impact of an ink droplet. Although UV ink is adopted as active light hardenability ink in the following explanation, it is good also as a thing using the ink of the character activated and hardened by active light, such as infrared rays, visible light, an electron beam, and X-rays. Active light is active light in a broad sense here. That is, the active light taken up on these specifications does not put only visible light, but electromagnetic waves, such as ultraviolet rays, infrared rays, an electron beam, and X-rays, are included. That is, active light activates and hardens ink. The construction material of the recording medium 99 can apply the construction material in which image formation is possible with resin, paper, or the other printers 1.

[0025]As shown in drawing 1 - drawing 3, the ink-jet printer 1, The conveyer style 11 which conveys the sheet shaped recording medium 99 to the vertical scanning direction B, as opposed to the vertical scanning direction B -- abbreviated -- with the guide member 2 which extends in the right-angled scanning direction A. The carriage 3 which is a mobile which is guided at the guide member 2 and moves to the scanning direction A along with the guide member 2, Two or more heads 4 and 4 and -- which carry out the regurgitation of the ink droplet of UV ink, and two or more sources 5 and 5 of UV light (irradiation means) and -- (it illustrates to drawing 2 etc.) which turn ultraviolet rays to the recording medium 99, and irradiate with them, The covering 9 (it illustrates to drawing 2 etc.) provided in each source 5 of UV light, and two or more ink tanks 6 and 6 and -- which store UV ink while being arranged down the carriage 3, The ink feed path 7 which supplies UV ink to the head 4 from the ink tank 6, The transformation pump 8 formed in each ink tank 6, and the chamber structure (sealing means) 10 for intercepting a building envelope from the open air, while storing the carriage 3 in an inside, The platen 12 allotted in the chamber structure 10 and the inactive gas feeding means (graphic display abbreviation) which supplies inertness inactive gas in the chamber structure 10 to UV ink are provided.

[0026]As shown in drawing 1, the ink tanks 6 and 6 and -- are exchangeable ink cartridges, and the UV ink of Isshiki is stored in each ink tank 6. That is, the UV ink of which color of several sorts of colors is stored in the one ink tank 6. Although the UV ink of a color fundamentally different every ink tank 6 is stored, the UV ink of the same color may be stored in the two or more ink tanks 6. As a color of the UV ink used for the ink-jet printer 1, It is based on yellow (Y), magenta (M), cyanogen (C), and black (K), in addition there are a white (W), light yellow (LY), light magenta (LM), light cyan (LC), light black (LK), etc.

[0027]The UV ink stored in each ink tank 6, The monomer or oligomer used as the paints (color material) according to a color, and the precursor of photopolymerization resin, It is formed including the photopolymerization initiator which generates a radical with ultraviolet energy and advances the crosslinking reaction or the polymerization reaction of a monomer or oligomer by this radical, the photopolymerization accelerator which promotes the initiation reaction of a photopolymerization initiator, etc. In connection with the photoreaction initiator which received the exposure of ultraviolet rays acting as a catalyst, a monomer or oligomer has crosslinking reaction or the character which hardens UV ink with such a reaction, although a polymerization reaction is carried out.

[0028]As shown in drawing 3, the conveyer style 11 has the function to convey the recording medium 99 to the vertical scanning direction B to compensate for operation of the carriage 3, and also has a function which repeats the function, i.e., a stop of the recording medium 99, to specifically convey the recording medium 99 intermittently, and conveyance. The details of the conveyer style 11 are mentioned later.

[0029]As shown in drawing 1, according to conveyance of the intermittent recording medium 99, along with the guide member 2, reciprocation moving of the carriage 3 is carried out to the scanning direction A, and when the recording medium 99 has specifically stopped, it carries out forward movement, double action, or

reciprocation moving to the scanning direction A. When the carriage 3 carries out uniform movement mostly (right above which it is got blocked and is the recording medium 99), comes out of the image formation range and moves to the end (getting it blocked cuff end) of a moving range in the image formation range, after it carries out slowdown movement and turning it up at the end by return, when it moves to the image formation range, it carries out acceleration movement. For example, if it is an example of drawing 1, the carriage 3, Acceleration movement is carried out until it is located right above the recording medium 99 from the left end of a moving range, Slowdown movement is carried out until it carries out uniform movement of right above the recording medium 99 which is an image formation range from the left to the right and is located in the right end of a moving range from right above the recording medium 99, Acceleration movement is carried out until it turns up at the right end and is located right above the recording medium 99, uniform movement of right above the recording medium 99 is carried out from the right to the left, and slowdown movement is carried out until it is located in the left end of a moving range from right above the recording medium 99.

[0030]The placed opposite of the platen 12 is carried out to the carriage 3, and it supports the recording medium 99 conveyed down the carriage 3 in the shape of approximately flatness.

[0031]The ink feed path 7 leads to the heads 4 and 4 and -- from the ink tanks 6 and 6 and -- for every color of UV ink, and the UV ink of each color is supplied to the head 4 which leads to the ink tank 6 concerned from each ink tank 6 through the ink feed path 7. That is, the color of the UV ink stored by which ink tank 6 is the same as that of the ink droplet breathed out from the head 4 which leads to the ink tank 6 via the ink feed path 7. The ink feed path 7 is formed from the flexible member so that movement of the carriage 3 can be followed.

[0032]Two or more transformation pumps 8 and 8 and -- are provided in the ink feed path 7. By changing the internal pressure of the ink feed path 7 where the transformation pump 8 leads to the head 4 from the ink tank 6, the ink supply from the ink tank 6 to the head 4 is changed.

[0033]The carriage 3 is explained in detail. As shown in drawing 2, the heads 4 and 4 and -- are attached to the carriage 3, the sources 5 and 5 of UV light and -- are attached to the carriage 3, and the coverings 9 and 9 and -- are further attached to the carriage 3 so that each source 5 of UV light may be covered. It follows, the heads 4 and 4 and -- scan the recording-medium 99 top with movement of the carriage 3, and the sources 5 and 5 of UV light and -- scan the recording-medium 99 top with the heads 4 and 4 and --.

[0034]Two or more deliveries (graphic display abbreviation) are formed in the undersurface of each head 4, and two or more deliveries serve as a single tier, and are arranged in the vertical scanning direction B. The discharging means (graphic display abbreviation) of a piezo-electric element is provided in the inside of each head 4, and an ink droplet is separately breathed out by the operation of a discharging means from each delivery. From the one head 4, the UV ink of which color of several sorts of colors is breathed out. Although the ink droplet of the UV ink of a color fundamentally different every head 4 is breathed out, the UV ink of the same color may be breathed out from the two or more heads 4.

[0035]Each source 5 of UV light comprises an ultraviolet ray lamp etc. which emit light with the irradiation energy stabilized in the ultraviolet rays of the specific wavelength area (for example, wavelength of 250 nm). The wavelength and irradiation intensity of ultraviolet rays which are emitted from the source 5 of UV light are suitably set up according to the construction material of the recording medium 99, or the kind of UV ink. As an ultraviolet ray lamp, LED (light emitting diode), a fluorescent lamp, a high-pressure mercury lamp, a metal halide lamp, a high-pressure-water silver spot lamp, a xenon lamp, etc. are applicable. The source 5 of UV light changes the wavelength and irradiation energy of ultraviolet rays with which it irradiates according to the construction material of the recording medium 99, or the kind of UV ink.

[0036]Each covering 9 has covered the source 5 of UV light from the top. With the covering 9, the ultraviolet rays from the source 5 of UV light were covered, the head 4 was not exposed to ultraviolet rays, and has come, and the recording medium 99 is conversely exposed to the ultraviolet rays from the source 5 of UV light. or [that the length of the source 5 of UV light in the vertical scanning direction B is longer than the length of the head 4 in the vertical scanning direction B] -- or it is almost equivalent.

[0037]The heads 4 and 4 and -- became a single tier, and are located in a line with the scanning direction

A at equal intervals. The sources 5 and 5 of UV light and -- also became a single tier, and are located in a line with the scanning direction A at equal intervals. The one head 4 intervenes between the two sources 5 and 5 of UV light, and the head 4 and the source 5 of UV light serve as alternation, and are arranged in the scanning direction A.

[0038]In these heads 4 and 4 and the sequence which becomes -- from the sources 5 and 5 of UV light, and --, the both ends of the scanning direction A serve as the source 5 of UV light. The distance of the head 4 and the source 5 of UV light of the next door of one of these is equal to distance with the source 5 of UV light of the next door of the another side. that is, the head 4 and the source 5 of UV light -- alternation -- and it is arranged by straight line shape at equal intervals. In drawing 2, although the numerals shown in each head 4 mean the color of the ink droplet breathed out, the arrangement of a color is not restricted like drawing 2.

[0039]The carriage 3 moves forwardly, double action is carried out, or when carrying out reciprocation moving, an ink droplet is breathed out from each head 4, and the recording medium 99 is reached. When the source 5 of UV light of the next door of the head 4 concerned is located right above the ink droplet which reached the target with movement of the carriage 3 at that time, it hardens by the ink which reached the target being irradiated by the ultraviolet rays from the source 5 of UV light concerned. That is, [above the platen 12], the regurgitation of an ink droplet is performed to the recording medium 99, and the exposure of ultraviolet rays is further performed to the ink droplet which reached the recording medium 99 [above the platen 12].

[0040]Next, the chamber structure 10 and the conveyer style 11 are explained. As shown in drawing 3, the chamber structure 10 is provided with the box 13 which surrounds the carriage 3 and the platen 12 which have a building envelope and have been arranged in this building envelope, and the divider plates 20, 21, 22, and 23 provided in the inner surface of the box 13. The upper face part 14 and the undersurface part 15 the box 13 turned [part] to the right-angled direction to the scanning direction A and the vertical scanning direction B. It is a thing of the approximately rectangular parallelepiped shape which consists of two lateral portions (graphic display abbreviation) which turned to the scanning direction A, and the front part 16 and the rear surface portion 17 which turned to the vertical scanning direction B, and the building envelope is formed of these fields. The breakthroughs 16a and 17a are formed in the surface parts 16 and 17, respectively, the breakthrough 16a leads within and without the box 13 in the front part 16, the breakthrough 17a leads within and without the box 13 in the rear surface portion 17, and the breakthroughs 16a and 17a have faced mutually.

[0041]The divider plate 20 is a projected rim which projects from the upper face part 14 to the building envelope of the box 13, and serves as a long picture in the scanning direction A. The divider plate 21 is a projected rim which projects from the undersurface part 15 to the building envelope of the box 13, and serves as a long picture in the scanning direction A. The divider plate 20 and the divider plate 21 face a sliding direction mutually, and are arranged. The divider plate 22 is a projected rim which projects from the upper face part 14 to the building envelope of the box 13, and serves as a long picture in the scanning direction A. The divider plate 23 is a projected rim which projects from the undersurface part 15 to the building envelope of the box 13, and serves as a long picture in the scanning direction A. The divider plate 22 and the divider plate 23 face a sliding direction mutually, and are arranged.

[0042]The building envelope of the box 13 is divided into three by the divider plates 20, 21, 22, and 23. That is, the building envelope of the box 13 comprises ** 13a of the upstream of the vertical scanning direction B, ** 13c of the downstream of the vertical scanning direction B, and ** 13a and ** 13b between ** 13c. ** 13a and ** 13b are divided by the divider plates 20 and 21, and ** 13b and ** 13c are divided by the divider plates 22 and 23.

[0043]Between the divider plate 20 and the divider plate 21, the carrier rollers 24 and 24 which constitute the conveyer style 11 are arranged. The carrier rollers 24 and 24 face mutually, approach, and are arranged, and it can be freely rotated to the circumference of the axial center of the scanning direction A. Similarly, between the divider plate 20 and the divider plate 21, the carrier rollers 25 and 25 which constitute the conveyer style 11 are arranged. The carrier rollers 25 and 25 face mutually, approach, and are arranged,

and it can be freely rotated to the circumference of the axial center of the scanning direction A. The carrier rollers 24 and 24 are close to the divider plates 20 and 21, respectively, and the carrier rollers 25 and 25 are close to the divider plates 22 and 23. That is, the passing mouth (crevice between the divider plate 20 and the divider plate 21) which passes to ** 13a and ** 13b is closed by the carrier rollers 24 and 24, and the passing mouth (crevice between the divider plate 22 and the divider plate 23) which passes to ** 13b and ** 13c is closed by the carrier rollers 25 and 25.

[0044]Carrying out side view, the point of contact of one carrier roller 24 and the carrier roller 24 of another side, the point of contact of one carrier roller 25 and the carrier roller 25 of another side, the breakthrough 16a, and the breakthrough 17a serve as about 1 linear shape in the vertical scanning direction B. And the recording medium 99 was inserted in into the box 13 through the breakthrough 16a, resulted in ** 13b through between the divider plate 20 and the divider plates 21, resulted in ** 13c through between the divider plate 22 and the divider plates 23, and has come out of the box 13 through the breakthrough 17b further. And the recording medium 99 is inserted into the carrier rollers 24 and 24 between the divider plate 20 and the divider plate 21, and is inserted into the carrier rollers 25 and 25 between the divider plate 22 and the divider plate 23. When any at least one of the carrier rollers 24, 24, 25, and 25 rotates, the recording medium 99 is conveyed to the vertical scanning direction B.

[0045]The platen 12 and the carriage 3 are arranged at ** 13b in the box 13. It will follow and reciprocation moving of the carriage 3 will be carried out to the scanning direction A within ** 13b. Since the carriage 3 is arranged in ** 13b, the heads 4 and 4, -- and the sources 5 and 5 of UV light, and -- are also arranged in ** 13b.

[0046]Although the heads 4 and 4 and -- carry out the regurgitation of the ink droplet towards the recording medium 99 conveyed on the platen 12, the ballistic trajectory of an ink droplet until the ink droplet breathed out from each delivery of each head 4 reaches the recording medium 99 consists in ** 13b. Of course, the part which the ink droplet breathed out from each delivery of each head 4 reaches, and the part where the ink droplet which consisted in ** 13b and reached the target is irradiated by the source 5 of UV light consist in ** 13b.

[0047]The above-mentioned inactive gas feeding means supplies inertness inactive gas in ** 13b to UV ink. As inactive gas, there are gaseous helium, gaseous neon, argon gas, krypton gas, nitrogen gas, carbon dioxide, etc. To gas which does not reduce the cure rate of UV ink other than these gases, i.e., the radical generated in the initiation reaction of a photopolymerization initiator, if it is inertness gas, it is applicable as inactive gas.

[0048]As an inactive gas feeding means, use a nitrogen gas bomb, use the device which uses the penetrable difference to the hollow fiber of oxygen and nitrogen, and separates only nitrogen gas out of the open air, or. The device which supplies inactive gas by the PSA (Pressure Swing Adsorption) method by activated carbon is used. [above the sequence which becomes the heads 4 and 4 and -- from the sources 5 and 5 of UV light, and --] as a feed route of inactive gas, inactive gas is generated, for example, and there is the method of supplying down the carriage 3 through between the source 5 of UV light and the heads 4. If ** 13b is intercepted by the above chamber structures 10 from the open air and inactive gas is supplied in ** 13b, inactive gas will be confined in ** 13b by the chamber structure 10, therefore ** 13b serves as an inert gas atmosphere, and the oxygen density in ** 13b falls. The deoxidant (deoxidation means) which absorbs oxygen may be formed in ** 13b. It is desirable to allocate a deoxidant in the position possible nearest to the recording medium 99 in the lower part of the head 3 especially, and it is still more preferred to allocate a deoxidant near the part which an ink droplet reaches. Fundamentally, a deoxidant reacts to oxygen (O₂) of ** 13b, and removes oxygen in ** 13b. as a deoxidant -- iron powder -- or it may be ageless.

[0049]Next, operation of the ink-jet printer 1 constituted as mentioned above is explained. The ink-jet printer 1 set working, ultraviolet rays have emitted from the source 5 of UV light, and it is irradiated with the recording medium 99 by ultraviolet rays. The ink-jet printer 1 sets working, inactive gas is supplied by the inactive gas feeding means in ** 13b, and the oxygen density in ** 13b falls by it. Under the present circumstances, by control of the inactive gas feeding means, the oxygen density in ** 13b is got blocked

from the oxygen density of the atmosphere besides the chamber structure 10, falls from the oxygen density (about 21% of volume concentration) of air, and, specifically, is about 0.1% – 10% of volume concentration.

[0050]The recording medium 99 passes through between the divider plate 20 and the divider plates 21 because the carrier rollers 24 and 24 rotate in this state, The recording medium 99 is carried in to ** 13b, and further, the recording medium 99 passes through between the divider plate 22 and the divider plates 23 because the carrier rollers 25 and 25 rotate, and it is taken out from ** 13b. Under the present circumstances, the recording medium 99 is intermittently conveyed to the vertical scanning direction B because the ink-jet printer 1 rotates the carrier rollers 24, 24, 25, and 25 a predetermined angle every. Here, when the recording medium 99 has stopped, into ** 13b, the carriage 3 moves forwardly and carries out double action, or carries out reciprocation moving in the scanning direction A. And while the carriage 3 is moving in the recording-medium 99 top, the heads 4 and 4 and -- breathe out an ink droplet from each delivery suitably, and an ink droplet reaches the recording medium 99. In connection with the carriage 3 moving, the source 5 of UV light next to the head 4 which breathed out the ink droplet concerned right above the ink droplet which reached the target is located, and, for this reason, it hardens by this ink droplet being irradiated by ultraviolet rays.

[0051]The ink-jet printer 1 is the reciprocation moving (or) of the carriage 3 as mentioned above. [forwardly and] After performing the exposure to double action, the regurgitation of an ink droplet, and the ink droplet that reached the target, prescribed distance conveyance of the recording medium 99 is carried out in the vertical scanning direction B at conveyer guard 11 (getting it blocked carrier rollers 24, 24, 25, and 25). And if the recording medium 99 stops, the ink-jet printer 1 will perform the exposure to the reciprocation moving (or forward movement, double action) of the carriage 3, the regurgitation of an ink droplet, and an ink droplet again. Henceforth, when the ink-jet printer 1 repeats above-mentioned operation, a picture is formed on the recording medium 99.

[0052]As mentioned above, by this embodiment, since inactive gas is supplied to ** 13b of the chamber structure 10, the oxygen density of ** 13b falls. Here, since it is [reactivity] higher for the radical generated in the initiation reaction of a photopolymerization initiator to receive oxygen more to the monomer or oligomer of photopolymerization resin, a radical will react to oxygen. For this reason, by this embodiment, although the ink droplet which reached the target produces hardening inhibition, since the oxygen density in ** 13b is falling, the ink droplet which reached the target does not produce hardening inhibition, and ultraviolet energy of the source 5 of UV light is not enlarged, but an ink droplet also hardens ** certainly.

[0053]By a deoxidant being formed in ** 13b, oxygen in ** 13b is absorbed by the deoxidant, oxygen in ** 13b is removed by the deoxidant, and the decreasing rate of the oxygen density in ** 13b becomes very good.

[0054]Since the crevice between the divider plate 20 and the divider plate 21 is closed by the carrier rollers 24 and 24 and the crevice between the divider plate 22 and the divider plate 23 is closed by the carrier rollers 25 and 25, The inactive gas in ** 13b is not revealed out of ** 13b, and oxygen besides ** 13b does not leak in ** 13b further. That is, the rise of the oxygen density in ** 13b is suppressed, it follows and hardening inhibition of an ink droplet does not arise.

[0055]When oxygen reacts to a radical, ozone occurs, but in this embodiment, since the oxygen density in ** 13b is very low, oxygen does not react to a radical and ozone does not occur. Therefore, generating of an ozone smell is also suppressed.

[0056]Since [of the sources 5 and 5 of UV light, and --] it can be managed even if it does not increase ultraviolet energy, the power consumption of the ink-jet printer 1 can be stopped, and it is not necessary to provide further the sources 5 and 5 of UV light, and the cooler style which cools --. Therefore, the circumference of the sources 5 and 5 of UV light and -- is simplified, and the ink-jet printer 1 becomes compact. Since [of the sources 5 and 5 of UV light, and --] it can be managed even if it does not increase ultraviolet energy, comparatively vulnerable construction material is also applicable as the recording medium 99 to ultraviolet rays.

[0057]Since the heads 4 and 4, -- and the sources 5 and 5 of UV light, and -- are arranged in ** 13b, it

consists in the basis of an inert gas atmosphere until it reaches the recording medium 99 and it is further irradiated with it by ultraviolet rays, after an ink droplet is breathed out. Oxygen does not adhere to an ink droplet between them, and an ink droplet does not produce hardening inhibition. Since the carriage 3 whole is arranged in ** 13b, the circumference of the chamber structure 10 is simplified and the ink-jet printer 1 compact as a whole is provided.

[0058]Without being limited to the above-mentioned embodiment, in the range which does not deviate from the meaning of this invention, various improvement is performed and this invention may make a change of a design. According to the above-mentioned embodiment, although the sources 5 and 5 of UV light and -- were provided in the carriage 3, if the ink droplet which reached the target can be irradiated with ultraviolet rays, it is not necessary to provide in the carriage 3. For example, the source of UV light which extended in the downstream of the vertical scanning direction B covering box 13 overall width of the scanning direction A from the carriage 3 may be established above the platen 12. Also in this case, the source of UV light is allocated in ** 13b of the box 13, and when the recording medium 99 is conveyed in the vertical scanning direction B after the breathed-out ink droplet reaches the target, it is irradiated with that ink droplet by ultraviolet rays when having passed through the bottom of the source of UV light.

[0059]Although the heads 4 and 4 and -- are provided in the carriage 3 and carry out reciprocation moving to the scanning direction A in the above-mentioned embodiment, what is called a line head that does not move may be replaced with the heads 4 and 4, -- and the carriages 3 and 3, and --, and may be provided. In this case, it becomes like drawing 4.

[0060]That is, the line head 30 is being fixed above the platen 12 in ** 13b. The deliveries 32 and 32 and -- become a single tier, and are formed in the undersurface of the line head 30 in the scanning direction A, The deliveries 33 and 33 and -- become a single tier in the scanning direction A, and are formed in the undersurface of the line head 30, The deliveries 34 and 34 and -- become a single tier in the scanning direction A, and are formed in the undersurface of the line head 30, and the deliveries 35 and 35 and -- become a single tier in the scanning direction A, and are formed in the undersurface of the line head 30. The deliveries 32 and 32, the sequence and the deliveries 33 and 33 of --, the sequence and the deliveries 34 and 34 of --, the sequence and the deliveries 35 and 35 of --, and the sequence of -- are crossed to the overall width of ** 13b of the scanning direction A.

[0061]All the colors of the UV ink breathed out from the deliveries 32 and 32 and -- are the same, Similarly all the colors of the UV ink breathed out from the deliveries 33 and 33 and -- are the same, all the colors of the UV ink breathed out from the deliveries 34 and 34 and -- are the same, and all the colors of the UV ink breathed out from the deliveries 35 and 35 and -- are the same. However, the colors of the UV ink breathed out from the deliveries 32, 33, 34, and 35 differ mutually, For example, from each delivery 32, the UV ink of yellow is breathed out, the UV ink of magenta is breathed out from each delivery 33, the UV ink of cyanogen is breathed out from each delivery 34, and the UV ink of black is breathed out from each delivery 35. What is necessary is just to establish two or more deliveries arranged by becoming a single tier in the scanning direction A in the undersurface of the line head 30, if the regurgitation of the UV ink of other colors is carried out.

[0062]In the case of an ink-jet printer like drawing 4, the source 31 of UV light which extended in the downstream of the vertical scanning direction B covering box 13 overall width of the scanning direction A from the line head 30 is established above the platen 12. The line head 30 and the source 31 of UV light are allocated in ** 13b. And it is irradiated with the ink droplet which was breathed out from the line head 30 and reached the recording medium 99 by ultraviolet rays, when the recording medium 99 is conveyed in the vertical scanning direction B and it has passed through the bottom of the source 31 of UV light. Since inactive gas is supplied by the inactive gas feeding means in ** 13b also in an ink-jet printer like drawing 4, Inactive gas is confined in ** 13b by the chamber structure 10, therefore ** 13b serves as an inert gas atmosphere, and the oxygen density in ** 13b falls. The ink droplet which reached the recording medium 99 does not produce hardening inhibition. It is good to allocate a deoxidant in ** 13b also in the case of an ink-jet printer like drawing 4.

[0063]By the way, ** 13b may be divided into two more in an ink-jet printer like drawing 4. To that is,

Takumi to whom the source 31 of UV light consists in an inside and Takumi to whom the line head 30 consists in an inside. Although ** 13b may be divided, it is good as for the bottom of an inert gas atmosphere only in ** to which the source 31 of UV light mainly consists in an inside in this case, and good as for the bottom of an inert gas atmosphere in both Takumi to whom ** to which the source 31 of UV light consists in an inside, and the line head 30 consist in an inside. Drawing 4 (a) is the fragmentary sectional view seen and shown in the scanning direction A, and drawing 4 (b), By break line D-D of drawing 4 (a), fracture, are the shown sectional view and about the ink-jet printer of drawing 4. The same numerals as the same component as the ink-jet printer 1 illustrated to drawing 1 - drawing 3 are attached, and the explanation is omitted, and also the graphic display of the platen 12 and the recording medium 99 is omitted in drawing 4 (b).

[0064]The box 13 as a sealing means does not close inactive gas thoroughly in the impact part of an ink droplet, various things, such as a screen with a closure operation, may be replaced with the box 13, and it may provide them, and what is intercepted so that the open air may not go into the impact part of an ink droplet may be replaced with the box 13, and it may provide it. For example, although it was considered as the structure where the line head 30 and the source 31 of UV light, or the carriage 3 is arranged in the chamber structure 10, It is not necessary to necessarily establish the chamber structure 10 instead, and the line head 30 and the source 31 of UV light, or the carriage 3 is surrounded with what is called an air curtain by inactive gas called nitrogen etc., for example. In that case, the inactive gas of an air curtain is supplied to the inside of the space surrounded by the air curtain, Inactive gas is confined in the space by an air curtain, the oxygen density around the recording medium 99 conveyed down the line head 30 and the source 31 of UV light, or the carriage 3 decreases, and the ink droplet which reached the recording medium 99 does not produce hardening inhibition.

[0065]That is, an inert gas atmosphere should just be supplied to the space which was intercepted from the open air and intercepted from the open air until the ink droplet breathed out from the line head 30 or the head 4 reaches a recording medium and is irradiated by ultraviolet rays by the source 5 of UV light, or the source 31 of UV light. It follows, and although it is desirable to arrange the source 5 of UV light or the source 31 of UV light in ** 13b, it does not necessarily need to be arranged in ** 13b. As for the box 13, when the source 5 of UV light or the source 31 of UV light is not arranged in ** 13b, it is needless to say that it is the construction material which has the permeability of ultraviolet rays.

[0066]It may be an ink-jet printer possessing the carriage 103 as shown in drawing 5. It is what replaces with the above-mentioned carriage 3 the carriage 103 shown in drawing 5, and is provided in the ink-jet printer 1, Although the above-mentioned chamber structure 10 is not formed in the ink-jet printer 1 possessing this carriage 103, the conveyer style which conveys the recording medium 99 intermittently to a vertical scanning direction is provided.

[0067]As shown in drawing 5, the carriage 103 like the above-mentioned carriage 3, According to conveyance of the intermittent recording medium 99, [above the platen 12] along with the guide member 2, reciprocation moving is carried out to the scanning direction A, and when the recording medium 99 has specifically stopped, forward movement, double action, or reciprocation moving is carried out to the scanning direction A.

[0068]The heads 104 and 4 and -- are attached to the carriage 103, the sources 105 and 105 of UV light and -- are also attached to it, and the coverings 109 and 109 and -- are also attached to the carriage 103 so that each source 105 of UV light may be covered. The head 104 possesses on the undersurface two or more deliveries arranged by becoming a single tier like the above-mentioned head 4 in the vertical scanning direction B, and an ink droplet is breathed out from a delivery. Since the source 105 of UV light is the same as the above-mentioned source 5 of UV light and the covering 109 is the same as the above-mentioned covering 9, detailed explanation is omitted.

[0069]The heads 104 and 104 and -- became a single tier, and are located in a line with the scanning direction A at equal intervals. The sources 105 and 105 of UV light and -- also became a single tier, and are located in a line with the scanning direction A at equal intervals. The one head 104 intervenes between the two sources 105,105 of UV light, and the head 104 and the source 105 of UV light serve as alternation,

and are arranged in the scanning direction A. the head 104 and the source 105 of UV light -- alternation -- and it is arranged by straight line shape at equal intervals.

[0070]The carriage 103 is formed in the case shape which carried out the opening caudad. That is, the carriage 103 possesses the box which comprises the front part 103a, the rear surface portion 103b, the lateral portion 103c, the lateral portion 103d, and the upper face part 103e. And the heads 104 and 104, --, the source 105.105 of UV light, -- and the coverings 109 and 109, and -- are provided in this box. And the curtain members 120 are attached to the lower end of the front part 103a, the rear surface portion 103b, the lateral portion 103c, and the lateral portion 103d. If it sees from a lower part, the curtain members 120 are formed so that it may surround. And the curtain members 120 droop from the lower end of the front part 103a, the rear surface portion 103b, the lateral portion 103c, and the lateral portion 103d. and the state where the curtain members 120 touched the recording medium 99 lightly -- or it is in the state where the minute crevice opened to the recording medium 99. Therefore, there is a building envelope surrounded by the box, the curtain members 120, and the recording medium 99 of the carriage 103, an ink droplet is breathed out from the head 104,104,104 in this building envelope, and an ink droplet reaches the recording medium 99 in this building envelope.

[0071]The ink-jet printer possessing the carriage 103 also possesses the inactive gas feeding means (graphic display abbreviation). This inactive gas feeding means supplies inactive gas in the box of the carriage 103 through the supply route 121. Therefore, inactive gas is confined in the building envelope surrounded by the box, the curtain members 120, and the recording medium 99 of the carriage 103, this building envelope serves as an inert gas atmosphere, and the oxygen density of this building envelope falls. Therefore, the ink droplet which reached the recording medium 99 does not produce hardening inhibition. And if the deoxidant is formed in the box of the carriage 103, the oxygen density fall efficiency of a building envelope will become very good further.

[0072]They may be a brush-like member, a member made of cloth, a member made from cotton, and a member of the thin shape of an elastic resin sheet instead of the curtain members 120. In drawing 5 (a), although the numerals shown in each head 104 mean the color of the ink droplet breathed out, the arrangement of a color is not restricted like drawing 5 (a).

[0073]By the way, although the ink-jet printer of drawing 3 or drawing 4 possesses the inactive gas feeding means, when the deoxidant is allocated in ** 13b, it is not necessary to provide the inactive gas feeding means. However, when the oxygen density in ** 13b does not become low enough with a deoxidant, it is desirable to provide an inactive gas feeding means in an ink-jet printer (for example, when the oxygen density in ** 13b is not less than about 10% of volume concentration). In the ink-jet printer of drawing 5, similarly, when the deoxidant is allocated in the box of the carriage 103, it is not necessary to provide an inactive gas feeding means in an ink-jet printer.

[0074]

[Effect of the Invention]According to this invention, since it is irradiated with the ink droplet which reached the recording medium by ultraviolet rays in the state where the oxygen density of a peripheral atmosphere fell, by oxygen, the ink droplet which reached the target does not produce hardening inhibition, and does not enlarge ultraviolet energy, but ** also hardens it certainly on a recording medium. Therefore, an ink droplet does not spread on a recording medium, but since the path of an ink droplet does not become large, a high definition picture is formed in a recording medium. In particular, even if a recording medium is the construction material in which an ink droplet called a resin film spreads easily, since an ink droplet hardens certainly, it is stabilized also to the recording medium of such construction material, and high definition image formation can be performed. Since the oxygen density around the ink droplet which reached the recording medium is very low, the reaction of a radical and oxygen does not arise and ozone does not occur. Therefore, generating of an ozone smell can also be suppressed. Since ultraviolet energy is not enlarged but active light hardenability ink also hardens ** certainly, image formation can also be carried out to the recording medium of construction material which deteriorates easily in ultraviolet rays.

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TECHNICAL FIELD

[Field of the Invention]This invention relates to the ink-jet printer which carries out image formation to a recording medium by carrying out the regurgitation of the ink to a recording medium.

[0002]

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PRIOR ART

[Description of the Prior Art]In recent years, many image formation methods using the ink-jet printer as an image formation method which can form a picture simple and cheaply are adopted. An ink-jet printer moves recording media, such as paper and a resin film, to a vertical scanning direction intermittently, and when the recording medium has stopped, it moves a head to the scanning direction which becomes right-angled with a vertical scanning direction on a recording medium. And while the head is moving to the scanning direction, an ink-jet printer carries out the regurgitation of the ink droplet to a recording medium from a head with a piezo-electric element or a heater. A picture is formed in a recording medium by operation of such an ink-jet printer.

[0003]There is active light hardenability ink hardened by the exposure of active light called ultraviolet rays as ink used for an ink-jet printer. The monomer or oligomer from which active light hardenability ink serves as paints and a precursor of a high molecular compound, for example, It is formed including the photopolymerization initiator etc. which generate a radical (active species) by active light energy (mainly ultraviolet energy), and advance the crosslinking reaction or the polymerization reaction of a monomer or oligomer by this radical, and hardens by the crosslinking reaction or the polymerization reaction by exposure of active light. The printer which carries out image formation in such active light hardenability ink is a low odor comparatively compared with the printer which carries out image formation in solvent system ink.

It is observed in recent years at the point which can perform record to a recording medium without ink absorbency.

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EFFECT OF THE INVENTION

[Effect of the Invention]According to this invention, since it is irradiated with the ink droplet which reached the recording medium by ultraviolet rays in the state where the oxygen density of a peripheral atmosphere fell, by oxygen, the ink droplet which reached the target does not produce hardening inhibition, and does not enlarge ultraviolet energy, but ** also hardens it certainly on a recording medium. Therefore, an ink droplet does not spread on a recording medium, but since the path of an ink droplet does not become large, a high definition picture is formed in a recording medium. In particular, even if a recording medium is the construction material in which an ink droplet called a resin film spreads easily, since an ink droplet hardens certainly, it is stabilized also to the recording medium of such construction material, and high definition image formation can be performed. Since the oxygen density around the ink droplet which reached the recording medium is very low, the reaction of a radical and oxygen does not arise and ozone does not occur. Therefore, generating of an ozone smell can also be suppressed. Since ultraviolet energy is not enlarged but active light hardenability ink also hardens ** certainly, image formation can also be carried out to the recording medium of construction material which deteriorates easily in ultraviolet rays.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]By the way, although a radical occurs in the initiation reaction of a photopolymerization initiator, a radical will be consumed at oxygen in the air reacting that it is radical, and the activity of active light hardenability ink will decrease by oxygen. Therefore, the ink droplet of active light hardenability ink will spread and spread on a recording medium, without hardening, after reaching a recording medium. It follows and a high-definition picture cannot be acquired. Especially, when a recording medium is a resin film, the breadth speed of an ink droplet is quick, and the actual condition is that carrying out image formation to a resin film in active light hardenability ink is not put in practical use.

[0005]In order that active light hardenability ink may harden certainly in the air, enlarging ultraviolet energy is also considered, but if ultraviolet energy is enlarged, a recording medium deteriorates easily and the recording medium of weak construction material cannot be used for ultraviolet rays.

[0006]Then, the technical problem of this invention is an ink-jet printer which can stop the breadth of the ink droplet after an ink droplet reaches the target, It is providing the ink-jet printer which is stabilized also to what kind of kind of recording medium, and can form a high definition picture in active light hardenability ink.

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MEANS

[Means for Solving the Problem]In order to solve the above technical problem, an ink-jet printer concerning the invention according to claim 1 is provided with the following.

A head which carries out the regurgitation towards a recording medium from on a recording medium by making into an ink droplet active light hardenability ink hardened by the exposure of active light.

An irradiation means which irradiates with active light an ink droplet which reached a recording medium.

A gas supply means by which an ink droplet which reached a recording medium supplies inertness inactive gas to a part irradiated by said irradiation means to active light hardenability ink.

[0008]In the invention according to claim 1, an ink droplet of active light hardenability ink is breathed out by recording medium by a head, and if an ink droplet reaches a recording medium, it will be irradiated with it by irradiation means at active light. Since inactive gas is supplied to a part where an ink droplet which reached a recording medium is irradiated by irradiation means by gas supply means, an oxygen density around ink falls. Therefore, by oxygen, an ink droplet which reached the target does not produce hardening inhibition, and does not enlarge ultraviolet energy, but also hardens ** certainly on a recording medium. Therefore, an ink droplet does not spread on a recording medium, but since a path of an ink droplet does not become large, a high definition picture is formed in a recording medium. In particular, even if a recording medium is the construction material in which an ink droplet called a resin film spreads easily, since an ink droplet hardens certainly, image formation can be performed also to a recording medium of such construction material.

[0009]By the way, active light hardenability ink contains a photopolymerization initiator fundamentally, a radical occurs in an initiation reaction of a photopolymerization initiator, and ozone occurs at this radical reacting to oxygen. However, in this invention, since the oxygen density around an ink droplet which reached the target is very low, a reaction of a radical and oxygen does not arise and ozone does not occur. Therefore, this invention does so an effect that generating of an ozone smell can also be suppressed. Since ultraviolet energy is not enlarged but an ink target also hardens ** certainly, a picture can also be formed in a recording medium of construction material which deteriorates easily in ultraviolet rays.

[0010]The invention according to claim 2 possesses further a sealing means which shuts up inactive gas with which an ink droplet which reached a recording medium was supplied to a part irradiated by said irradiation means by said gas supply means in the ink-jet printer according to claim 1.

[0011]Since inactive gas is confined in a part where an ink droplet which reached the target is irradiated by irradiation means in the invention according to claim 2 by sealing means, a decreasing rate of an oxygen density of the part is dramatically high. Therefore, an ink droplet which reached the target does not produce hardening inhibition by oxygen, but does not enlarge ultraviolet energy but also hardens ** certainly on a recording medium. Therefore, an ink droplet does not spread on a recording medium, but it follows and a high definition picture is formed in a recording medium. Since an ink droplet hardens certainly, image formation can be performed also to a recording medium of construction material with which an ink droplet called a resin film spreads easily. Since ultraviolet energy is not enlarged but an ink target also hardens ** certainly, a picture can also be formed in a recording medium of construction material which

deteriorates easily in ultraviolet rays. Since an oxygen density around an ink droplet which reached the target falls, a reaction of a radical and oxygen does not arise, and ozone does not occur, but generating of an ozone smell can also be suppressed. The sealing means does not close inactive gas thoroughly in an impact part, and they may be various things called a screen with a closure operation, and it may intercept it so that the open air may not go into an impact part.

[0012]An ink-jet printer concerning the invention according to claim 4 is provided with the following.

A head which carries out the regurgitation towards a recording medium from on a recording medium by making into an ink droplet active light hardenability ink hardened by the exposure of active light.

An irradiation means which irradiates with active light an ink droplet which reached a recording medium.

A deoxidation means by which an ink droplet which reached a recording medium removes oxygen from a part irradiated by said irradiation means.

[0013]In the invention according to claim 4, since oxygen is removed from a part where an ink droplet which reached the target is irradiated by irradiation means by deoxidation means, an ink droplet which reached the target does not produce hardening inhibition by oxygen, but it does not enlarge ultraviolet energy but ** also hardens it certainly on a recording medium. Therefore, an ink droplet does not spread on a recording medium, but it follows and a high definition picture is formed in a recording medium. Since an ink droplet hardens certainly, image formation can be performed also to a recording medium of construction material with which an ink droplet called a resin film spreads easily. Since ultraviolet energy is not enlarged but an ink target also hardens ** certainly, a picture can also be formed in a recording medium of construction material which deteriorates easily in ultraviolet rays. Since an oxygen density around an ink droplet which reached the target falls, a reaction of a radical and oxygen does not arise, and ozone does not occur, but generating of an ozone smell can also be suppressed.

[0014]In the ink-jet printer according to claim 2, the invention according to claim 3 said sealing means, Inside of said surrounding body serves as an inert gas atmosphere because an ink droplet which reached a recording medium is a surrounding body which surrounds a part irradiated by said irradiation means and said gas supply means supplies inactive gas in said surrounding body.

[0015]The invention according to claim 5 possesses further a surrounding body in which an ink droplet which reached a recording medium surrounds a part irradiated by said irradiation means in the ink-jet printer according to claim 4.

[0016]In the invention according to claim 3 or 5, it is irradiated with an ink droplet which reached a recording medium in a surrounding body by ultraviolet rays from an irradiation means. Here, an oxygen density of a surrounding body hurts very low, an ink droplet does not produce hardening inhibition, and also a reaction of a radical and oxygen does not arise and ozone does not occur.

[0017]A ballistic trajectory of an ink droplet after the invention according to claim 6 is breathed out by said head in the ink-jet printer according to claim 3 or 5 until it reaches a recording medium consists in said surrounding body.

[0018]In the invention according to claim 6, a ballistic trajectory of an ink droplet from a head to a recording medium consists in a surrounding body, and since the oxygen density in a surrounding body is very low, during flight, an ink droplet adheres oxygen or does not contain it. Therefore, an ink droplet is certainly hardened, even if ultraviolet rays glare, after reaching the target.

[0019]As for the invention according to claim 7, in the ink-jet printer according to claim 3, 5, or 6, said head and said irradiation means are allotted in said surrounding body.

[0020]In the invention according to claim 7, since a head and an irradiation means are allotted in a surrounding body, an ink-jet printer is simplified and miniaturized.

[0021]In the ink-jet printer according to claim 3, 5, 6, or 7 the invention according to claim 8, A passing mouth which leads inside and outside is provided in said surrounding body, it is provided so that two rollers by which the placed opposite was carried out mutually may plug up said passing mouth, and a recording medium inserted into said two rollers passes said passing mouth by rotation of said two rollers.

[0022]In the invention according to claim 8, a recording medium is carried in in a surrounding body through

a passing mouth, or it is taken out out of a surrounding body. Here, an ink droplet which pumping of a gas in a surrounding body and the gas besides a surrounding body was carried out through a passing mouth, and an oxygen density in a surrounding body might rise, therefore reached the target may produce hardening inhibition. However, in the invention according to claim 8, since a passing mouth is closed by two rollers, substitution of a gas the inside of a surrounding body and besides a surrounding body does not arise, and an ink droplet which reached the target does not produce hardening inhibition.

[0023]

[Embodiment of the Invention]A drawing is used for below and the concrete mode of this invention is explained to it. However, the scope of an invention is not limited to the example of a graphic display.

Drawing 1 is a perspective view showing the important section of the ink-jet printer 1, and drawing 2 is a bottom view showing the carriage 3 with which the ink-jet printer 1 is equipped. Drawing 3 is the drawing in which the chamber structure 10 with which the ink-jet printer 1 is equipped was shown, and is the fragmentary sectional view seen and shown in the scanning direction A of drawing 1.

[0024]The ultraviolet curing nature ink which has the character which hardens the ink-jet printer 1 by the exposure of the ultraviolet rays as active light. (it is hereafter called "UV ink".) -- it breathes out towards the recording medium 99 as a drop (henceforth an "ink droplet"), and image formation is performed to the recording medium 99 by performing UV irradiation after impact of an ink droplet. Although UV ink is adopted as active light hardenability ink in the following explanation, it is good also as a thing using the ink of the character activated and hardened by active light, such as infrared rays, visible light, an electron beam, and X-rays. Active light is active light in a broad sense here. That is, the active light taken up on these specifications does not put only visible light, but electromagnetic waves, such as ultraviolet rays, infrared rays, an electron beam, and X-rays, are included. That is, active light activates and hardens ink. The construction material of the recording medium 99 can apply the construction material in which image formation is possible with resin, paper, or the other printers 1.

[0025]As shown in drawing 1 - drawing 3, the ink-jet printer 1, The conveyer style 11 which conveys the sheet shaped recording medium 99 to the vertical scanning direction B, as opposed to the vertical scanning direction B -- abbreviated -- with the guide member 2 which extends in the right-angled scanning direction A. The carriage 3 which is a mobile which is guided at the guide member 2 and moves to the scanning direction A along with the guide member 2, Two or more heads 4 and 4 and -- which carry out the regurgitation of the ink droplet of UV ink, and two or more sources 5 and 5 of UV light (irradiation means) and -- (it illustrates to drawing 2 etc.) which turn ultraviolet rays to the recording medium 99, and irradiate with them, The covering 9 (it illustrates to drawing 2 etc.) provided in each source 5 of UV light, and two or more ink tanks 6 and 6 and -- which store UV ink while being arranged down the carriage 3, The ink feed path 7 which supplies UV ink to the head 4 from the ink tank 6, the transformation pump 8 formed in each ink tank 6, and the chamber structure for intercepting a building envelope from the open air, while storing the carriage 3 in an inside

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]Drawing 1 is a perspective view showing the important section of the ink-jet printer with which this invention was applied.

[Drawing 2]Drawing 2 is a bottom view showing roughly the carriage with which the above-mentioned ink-jet printer is equipped.

[Drawing 3]Drawing 3 is a sectional view seeing and showing from the side the chamber structure in which the above-mentioned carriage was stored.

[Drawing 4]The above-mentioned ink-jet printer of drawing 4 (a) is a sectional view seeing and showing from the side the chamber structure with which the ink-jet printer of example of another is equipped.

Drawing 4 (b) is a sectional view seeing and showing this chamber structure from a lower part.

[Drawing 5]Drawing 5 (a) is the bottom view in which the above-mentioned ink-jet printer showed roughly the carriage with which the ink-jet printer of example of another is equipped.

Drawing 5 (b) is a perspective view showing this carriage with a recording medium.

[Description of Notations]

1 Ink-jet printer

4 and 104 Head

5, 31, 105, the source of 106 UV light (irradiation means)

10, 110 chamber structures (a sealing means, surrounding body)

11 Conveyer style

13 and 113 Box

13b **

20, 21, 22, and 23 Divider plate

24 and 25 Carrier roller (roller)

30 Line head (head)

103 Carriage (a sealing means, surrounding body)

120 Curtain members (a sealing means, surrounding body)

[Translation done.]

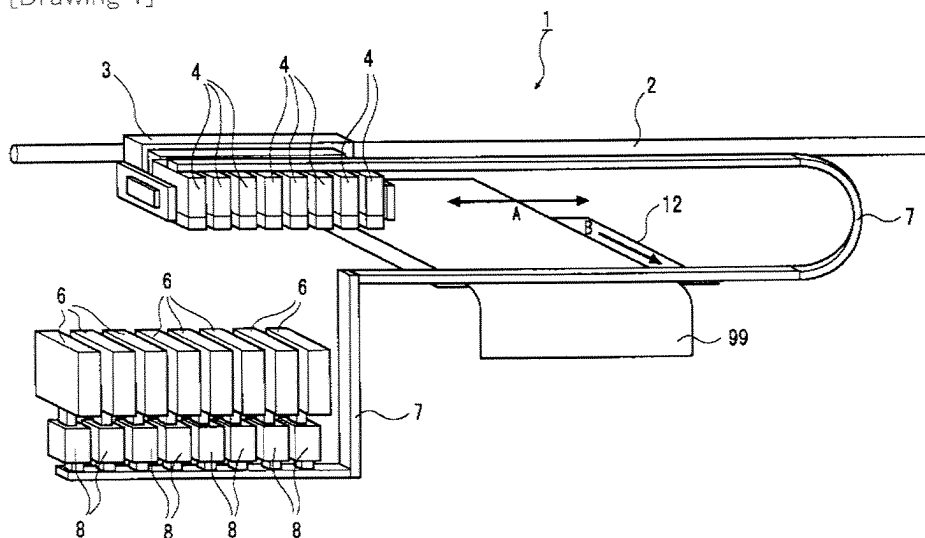
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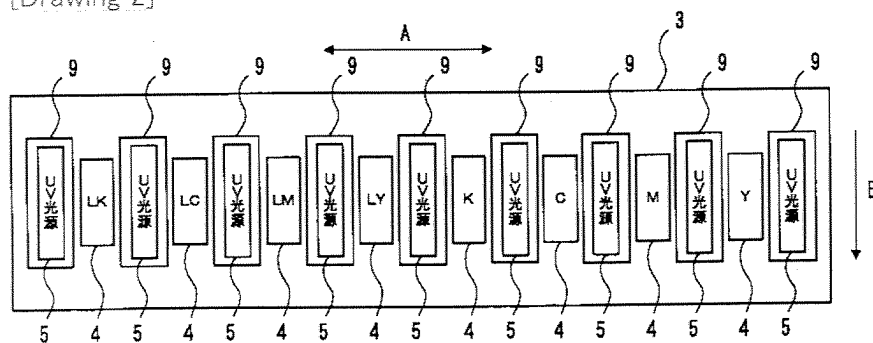
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DRAWINGS

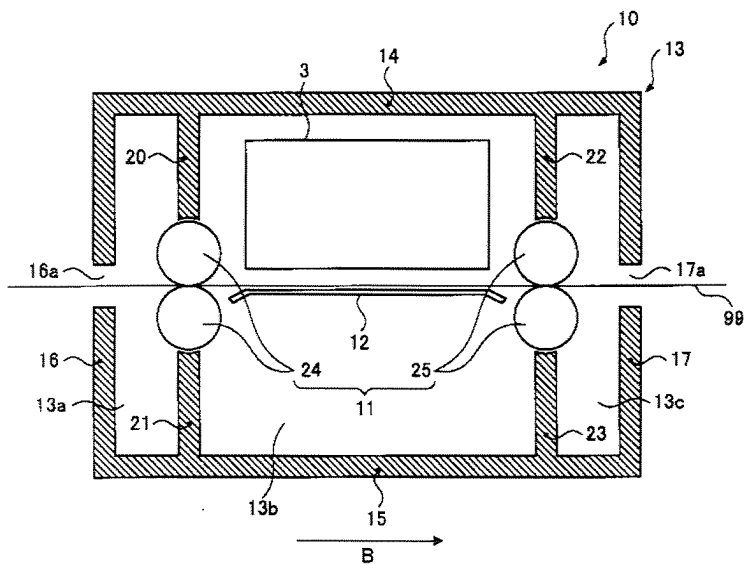
[Drawing 1]



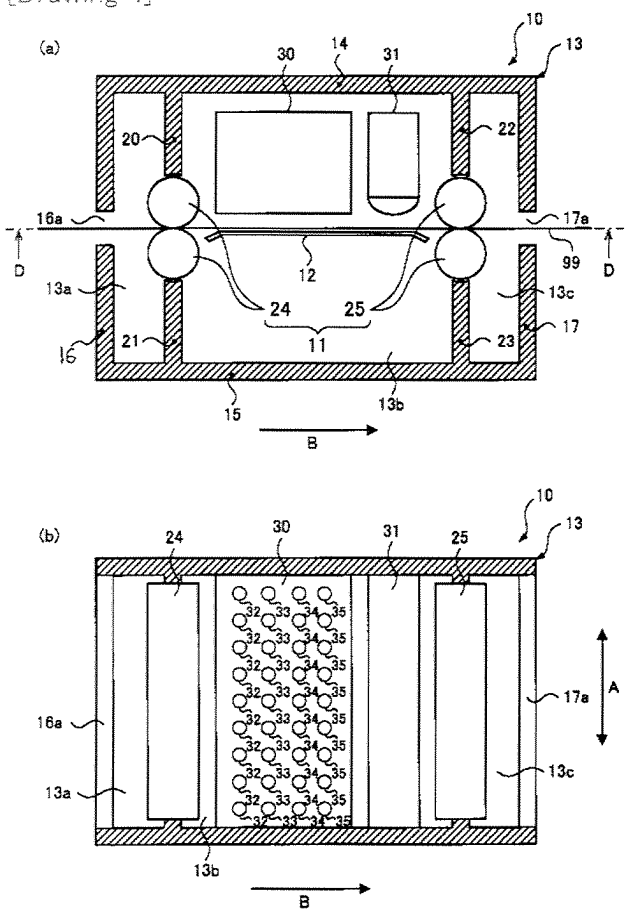
[Drawing 2]



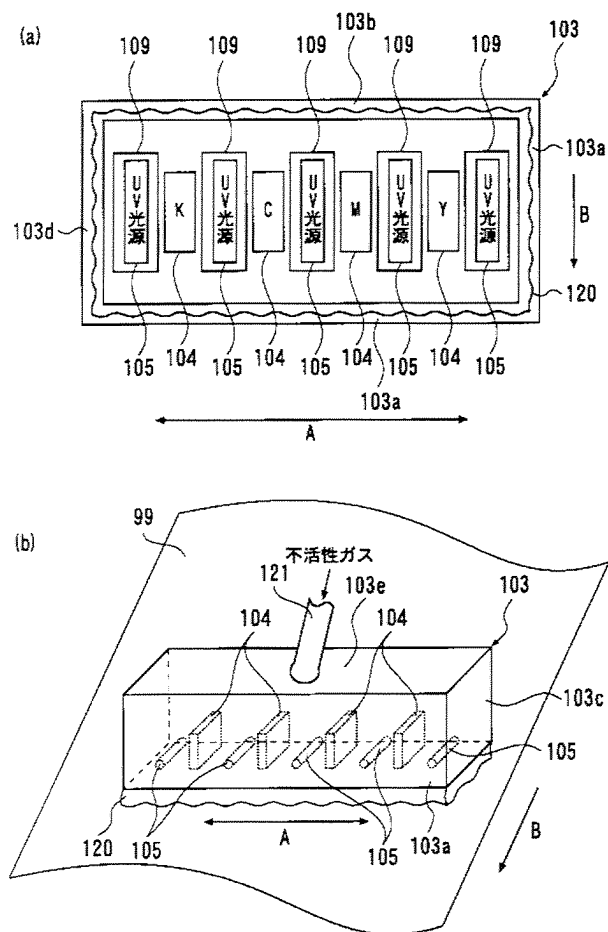
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]

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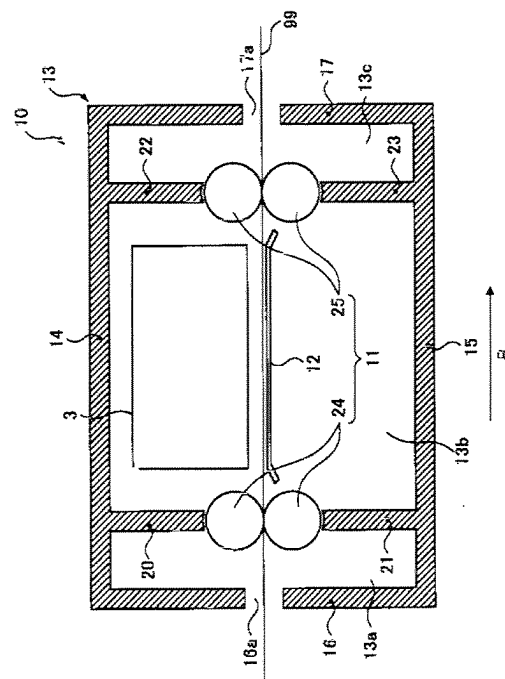
Fターム(参考) 2C056 EC21 FC01 FD20 HA29 HA44

(54) 【発明の名称】 インクジェットプリンタ

(57) 【要約】

【課題】 本発明の課題は、インク滴が着弾した後にそのインク滴の広がりを抑えることができるインクジェットプリンタを提供することである。

【解決手段】 インクジェットプリンタ1は、内部に室13bを有するチャンバー構造10と、チャンバー構造10内に配置されているキャリッジ3と、室13bに不活性ガスを供給する不活性ガス供給手段と、を備える。キャリッジ3は、主走査方向Aに往復移動する。また、キャリッジ3には、酸素と反応性の高いインク滴を記録媒体99に向けて吐出するヘッド4、4、…が設けられており、ヘッド4とヘッド4との間には、UV光源5が設けられている。室13bに不活性ガスが供給されることで、室13bの酸素濃度が低下し、記録媒体99に着弾したインク滴は硬化阻害を生じない。



【特許請求の範囲】

【請求項1】活性光の照射により硬化する活性光硬化性インクをインク滴として記録媒体上から記録媒体に向けて吐出するヘッドと、記録媒体に着弾したインク滴に活性光を照射する照射手段と、記録媒体に着弾したインク滴が前記照射手段によって照射される箇所に、活性光硬化性インクに対して不活性な不活性ガスを供給するガス供給手段と、を備えるインクジェットプリンタ。

【請求項2】記録媒体に着弾したインク滴が前記照射手段によって照射される箇所に、前記ガス供給手段で供給された不活性ガスを閉じ込める封止手段を更に具備する請求項1記載のインクジェットプリンタ。

【請求項3】前記封止手段は、記録媒体に着弾したインク滴が前記照射手段によって照射される箇所を包囲する包囲体であり、前記ガス供給手段が前記包囲体内に不活性ガスを供給することで前記包囲体内が不活性ガス雰囲気となることを特徴とする請求項2記載のインクジェットプリンタ。

【請求項4】活性光の照射により硬化する活性光硬化性インクをインク滴として記録媒体上から記録媒体に向けて吐出するヘッドと、記録媒体に着弾したインク滴に活性光を照射する照射手段と、記録媒体に着弾したインク滴が前記照射手段によって照射される箇所から酸素を除去する酸素除去手段と、を備えるインクジェットプリンタ。

【請求項5】記録媒体に着弾したインク滴が前記照射手段によって照射される箇所を包囲する包囲体を更に具備する請求項4記載のインクジェットプリンタ。

【請求項6】前記ヘッドによって吐出されてから記録媒体に着弾するまでのインク滴の弾道が前記包囲体内に存することを特徴とする請求項3又は5記載のインクジェットプリンタ。

【請求項7】前記ヘッド及び前記照射手段が前記包囲体内に配されていることを特徴とする請求項3、5又は6記載のインクジェットプリンタ。

【請求項8】前記包囲体には内外を通じる通過口が設けられており、互いに対向配置された二つのローラが前記通過口を塞ぐように設けられており、前記二つのローラに挟まれた記録媒体が前記二つのローラの回転によって前記通過口を通過することを特徴とする請求項3、5、6又は7記載のインクジェットプリンタ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、記録媒体にインクを吐出することによって記録媒体に画像形成するインクジェットプリンタに関する。

【0002】

【従来の技術】近年、簡便且つ安価に画像を形成できる画像形成方法として、インクジェットプリンタを用いた画像形成方法が数多く採用されている。インクジェットプリンタは、紙、樹脂フィルムといった記録媒体を副走査方向に間欠的に移動させ、記録媒体が停止している際に副走査方向と直角となる主走査方向にヘッドを記録媒体上で移動させる。そして、ヘッドが主走査方向に移動している最中に、インクジェットプリンタは、ピエゾ素子又はヒータでヘッドからインク滴を記録媒体に吐出する。このようなインクジェットプリンタの動作によって、記録媒体に画像が形成される。

【0003】インクジェットプリンタに用いられるインクとして、紫外線といった活性光の照射により硬化する活性光硬化性インクがある。活性光硬化性インクは、例えば、顔料と、高分子化合物の前駆体となるモノマー或いはオリゴマーと、活性光エネルギー（主に紫外線エネルギー）によりラジカル（活性種）を発生してこのラジカルによってモノマー或いはオリゴマーの架橋反応或いは重合反応を進行させる光重合開始剤等を含んで組成され、活性光の照射による架橋反応或いは重合反応によって硬化する。このような活性光硬化性インクで画像形成するプリンタは、溶剤系インクで画像形成するプリンタに比べ比較的低臭気であり、インク吸収性の無い記録媒体への記録が出来る点で近年注目されている。

【0004】

【発明が解決しようとする課題】ところで、光重合開始剤の開始反応においてラジカルが発生するが、空気中の酸素がラジカルと反応することでラジカルが消費されてしまい、活性光硬化性インクの活性が酸素によって低減してしまう。そのため、活性光硬化性インクのインク滴は、記録媒体に着弾してから、硬化せずに記録媒体上で広がって滲んでしまう。従い、高画質の画像を得られないことがある。特に、記録媒体が樹脂フィルムである場合、インク滴の広がり速度が速く、樹脂フィルムに活性光硬化性インクで画像形成することは実用化されていないのが現状である。

【0005】また、空気中において活性光硬化性インクが確実に硬化するために、紫外線エネルギーを大きくすることも考えられるが、紫外線エネルギーを大きくすると記録媒体が劣化しやすく、紫外線に弱い材質の記録媒体を用いることができない。

【0006】そこで、本発明の課題は、インク滴が着弾した後にそのインク滴の広がりを抑えることができるインクジェットプリンタであって、どのような種類の記録媒体に対しても安定して高精細な画像を活性光硬化性インクで形成することができるインクジェットプリンタを提供することである。

【0007】

【課題を解決するための手段】以上の課題を解決するために、請求項1記載の発明に係るインクジェットプリン

タは、活性光の照射により硬化する活性光硬化性インクをインク滴として記録媒体上から記録媒体に向けて吐出するヘッドと、記録媒体に着弾したインク滴に活性光を照射する照射手段と、記録媒体に着弾したインク滴が前記照射手段によって照射される箇所に、活性光硬化性インクに対して不活性な不活性ガスを供給するガス供給手段と、を具備することを特徴とする。

【0008】請求項1記載の発明では、ヘッドによって記録媒体に活性光硬化性インクのインク滴が吐出されて、インク滴は記録媒体に着弾したら、照射手段によって活性光に照射される。記録媒体に着弾したインク滴が照射手段により照射される箇所に不活性ガスがガス供給手段によって供給されるため、インクの周囲の酸素濃度が低下する。そのため、着弾したインク滴は、酸素によって硬化阻害を生じず、紫外線エネルギーを大きくせずとも記録媒体上で確実に硬化する。従って、インク滴が記録媒体上で滲まず、インク滴の径が大きくなりから高精細な画像が記録媒体に形成される。特に、記録媒体が樹脂フィルムといったインク滴が広がりやすい材質であっても、インク滴が確実に硬化するからこのような材質の記録媒体に対しても画像形成を行える。

【0009】ところで、基本的に活性光硬化性インクは光重合開始剤を含んでおり、光重合開始剤の開始反応でラジカルが発生し、このラジカルが酸素と反応することでオゾンが発生する。ところが、本発明では、着弾したインク滴の周囲の酸素濃度が非常に低いため、ラジカルと酸素との反応が生じずオゾンが発生しない。そのため、本発明は、オゾン臭の発生も抑えることができるという効果を奏する。また、紫外線エネルギーを大きくせずともインクの的に確実に硬化するため、紫外線で劣化しやすい材質の記録媒体に画像を形成することもできる。

【0010】請求項2記載の発明は、請求項1記載のインクジェットプリンタにおいて、記録媒体に着弾したインク滴が前記照射手段によって照射される箇所に、前記ガス供給手段で供給された不活性ガスを閉じ込める封止手段を更に具備することを特徴とする。

【0011】請求項2記載の発明では、着弾したインク滴が照射手段により照射される箇所に不活性ガスが封止手段によって閉じ込められるため、その箇所の酸素濃度の低下率が非常に高い。そのため、着弾したインク滴は、酸素による硬化阻害を生じず、紫外線エネルギーを大きくせずとも記録媒体上で確実に硬化する。故にインク滴が記録媒体上で滲まず、従い高精細な画像が記録媒体に形成される。また、インク滴が確実に硬化するため、樹脂フィルムといったインク滴が広がりやすい材質の記録媒体に対しても画像形成を行える。また、紫外線エネルギーを大きくせずともインクの的に確実に硬化するため、紫外線で劣化しやすい材質の記録媒体に画像を形成することもできる。また、着弾したインク滴の周囲の酸素濃度が低下するため、ラジカルと酸素との反応が生

じずオゾンが発生せず、オゾン臭の発生も抑えることができる。なお、封止手段は、着弾箇所に不活性ガスを完全に封止できなくても良く、封止作用がある遮蔽体といった種々のものであっても良いし、着弾箇所に外気が入らないように遮断するものであっても良い。

【0012】請求項4記載の発明に係るインクジェットプリンタは、活性光の照射により硬化する活性光硬化性インクをインク滴として記録媒体上から記録媒体に向けて吐出するヘッドと、記録媒体に着弾したインク滴に活性光を照射する照射手段と、記録媒体に着弾したインク滴が前記照射手段によって照射される箇所から酸素を除去する酸素除去手段と、を具備することを特徴とする。

【0013】請求項4記載の発明では、着弾したインク滴が照射手段により照射される箇所から酸素が酸素除去手段によって除去されるため、着弾したインク滴は、酸素による硬化阻害を生じず、紫外線エネルギーを大きくせずとも記録媒体上で確実に硬化する。故にインク滴が記録媒体上で滲まず、従い高精細な画像が記録媒体に形成される。また、インク滴が確実に硬化するため、樹脂フィルムといったインク滴が広がりやすい材質の記録媒体に対しても画像形成を行える。また、紫外線エネルギーを大きくせずともインクの的に確実に硬化するため、紫外線で劣化しやすい材質の記録媒体に画像を形成することもできる。また、着弾したインク滴の周囲の酸素濃度が低下するため、ラジカルと酸素との反応が生じずオゾンが発生せず、オゾン臭の発生も抑えることができる。

【0014】請求項3記載の発明は、請求項2記載のインクジェットプリンタにおいて、前記封止手段は、記録媒体に着弾したインク滴が前記照射手段によって照射される箇所を包囲する包囲体であり、前記ガス供給手段が前記包囲体内に不活性ガスを供給することで前記包囲体内が不活性ガス雰囲気となることを特徴とする。

【0015】請求項5記載の発明は、請求項4記載のインクジェットプリンタにおいて、記録媒体に着弾したインク滴が前記照射手段によって照射される箇所を包囲する包囲体を更に具備することを特徴とする。

【0016】請求項3又は5記載の発明では、記録媒体に着弾したインク滴は包囲体内において照射手段からの紫外線に照射される。ここで、包囲体の酸素濃度が非常に低いため、インク滴が硬化阻害を生じない上、ラジカルと酸素との反応が生じずオゾンが発生しない。

【0017】請求項6記載の発明は、請求項3又は5記載のインクジェットプリンタにおいて、前記ヘッドによって吐出されてから記録媒体に着弾するまでのインク滴の弾道が前記包囲体内に存することを特徴とする。

【0018】請求項6記載の発明では、ヘッドから記録媒体までのインク滴の弾道が包囲体内に存し、包囲体内の酸素濃度が非常に低いため、インク滴は飛翔中に酸素を付着したり含有したりしない。従って、インク滴は、着弾してから紫外線に照射されても確実に硬化する。

【0019】請求項7記載の発明は、請求項3、5又は6記載のインクジェットプリンタにおいて、前記ヘッド及び前記照射手段が前記包囲体内に配されていることを特徴とする。

【0020】請求項7記載の発明では、ヘッド及び照射手段が包囲体内に配されているため、インクジェットプリンタが簡素化されてコンパクト化される。

【0021】請求項8記載の発明は、請求項3、5、6又は7記載のインクジェットプリンタにおいて、前記包囲体には内外を通じる通過口が設けられており、互いに対向配置された二つのローラが前記通過口を塞ぐように設けられており、前記二つのローラに挟まれた記録媒体が前記二つのローラの回転によって前記通過口を通過することを特徴とする。

【0022】請求項8記載の発明では、通過口を通じて記録媒体が包囲体内に搬入されたり、包囲体内から搬出されたりする。ここで、包囲体内の気体及び包囲体外の気体が通過口を通じて吸排気されて、包囲体内の酸素濃度が上昇する可能性があり、そのため、着弾したインク滴が硬化阻害を生じることもある。しかしながら、請求項8記載の発明では、通過口が二つのローラによって塞がれているため、包囲体内と包囲体外の気体の置換が生じず、着弾したインク滴が硬化阻害を生じない。

【0023】

【発明の実施の形態】以下に、図面を用いて本発明の具体的な態様について説明する。ただし、発明の範囲は、図示例に限定されない。図1は、インクジェットプリンタ1の要部を示した斜視図であり、図2は、インクジェットプリンタ1に備わるキャリッジ3を示した下面図である。また、図3は、インクジェットプリンタ1に備わるチャンバー構造10を示した図面であって、図1の主走査方向Aに見て示した部分断面図である。

【0024】インクジェットプリンタ1は、活性光としての紫外線の照射により硬化する性質を有する紫外線硬化性インク（以下、「UVインク」という。）を滴（以下、「インク滴」という。）として記録媒体99に向けて吐出し、インク滴の着弾後に紫外線照射を行うことで記録媒体99に画像形成を行うものである。以下の説明では、活性光硬化性インクとしてUVインクを採用しているが、赤外線、可視光線、電子線、X線といった活性光によって活性化して硬化する性質のインクを用いるものとしてもよい。ここで活性光とは、広義の活性光である。つまり、本明細書で取りあげる活性光とは、可視光線だけをさすのではなく、紫外線、赤外線、電子線、X線等といった電磁波を含む。即ち、活性光は、インクを活性化して硬化するものである。また、記録媒体99の材質は、樹脂、紙又はその他プリンタ1によって画像形成可能な材質を適用可能である。

【0025】図1～図3に示すように、インクジェットプリンタ1は、シート状の記録媒体99を副走査方向B

に搬送する搬送機構11と、副走査方向Bに対して略直角な主走査方向Aに延在するガイド部材2と、ガイド部材2に案内されてガイド部材2に沿って主走査方向Aに移動する移動体であるキャリッジ3と、UVインクのインク滴を吐出する複数のヘッド4、4、…と、紫外線を記録媒体99に向けて照射する複数のUV光源（照射手段）5、5、…（図2等に図示）と、各UV光源5に設けられたカバー9（図2等に図示）と、キャリッジ3の下方に配置されているとともにUVインクを貯蔵する複数のインクタンク6、6、…と、インクタンク6からヘッド4へUVインクを供給するインク供給路7と、各インクタンク6に設けられた変圧ポンプ8と、内部にキャリッジ3を取めるとともに内部空間を外気から遮断するためのチャンバー構造（封止手段）10と、チャンバー構造10内に配されるプラテン12と、UVインクに対して不活性な不活性ガスをチャンバー構造10内に供給する不活性ガス供給手段（図示略）と、を具備する。

【0026】図1に示すように、インクタンク6、6、…は、交換することのできるインクカートリッジであり、それぞれのインクタンク6には一色のUVインクが貯蔵されている。つまり、一つのインクタンク6には、数種の色の中の何れかの色のUVインクが貯蔵されている。基本的にインクタンク6ごとに異なる色のUVインクが貯蔵されているが、同じ色のUVインクが二以上のインクタンク6に貯蔵されていても良い。インクジェットプリンタ1に用いられるUVインクの色としては、イエロー（Y）、マゼンタ（M）、シアン（C）、ブラック（K）を基本としており、その他にホワイト（W）、ライトイエロー（LY）、ライトマゼンタ（LM）、ライトシアン（LC）、ライトブラック（LK）等がある。

【0027】各インクタンク6に貯蔵されるUVインクは、色に応じた顔料（色材）と、光重合樹脂の前駆体となるモノマー或いはオリゴマーと、紫外線エネルギーによりラジカルを発生してこのラジカルによってモノマー或いはオリゴマーの架橋反応或いは重合反応を進行させる光重合開始剤と、光重合開始剤の開始反応を促進させる光重合促進剤等を含んで組成されている。紫外線の照射を受けた光反応開始剤が触媒として作用することに伴って、モノマー或いはオリゴマーが架橋反応或いは重合反応するが、UVインクはこのような反応に伴って硬化する性質を有する。

【0028】図3に示すように、搬送機構11は、キャリッジ3の動作に合わせて記録媒体99を副走査方向Bに搬送する機能を有し、具体的には、間欠的に記録媒体99を搬送する機能、つまり、記録媒体99の停止及び搬送を繰り返す機能も有する。なお、搬送機構11の詳細については後述する。

【0029】図1に示すように、キャリッジ3は、間欠的な記録媒体99の搬送に合わせて、ガイド部材2に沿

って主走査方向Aに往復移動するものであり、具体的には記録媒体99が停止している際に主走査方向Aに往動、復動又は往復移動をするものである。更に、キャリッジ3は、画像形成範囲において（つまり、記録媒体99の直上では）ほぼ等速移動をし、画像形成範囲から出て移動範囲の端（つまり、折返し端）まで移動する際には減速移動し、折返し端で折り返してから画像形成範囲まで移動する際には加速移動をする。例えば、図1の例であれば、キャリッジ3は、移動範囲の左端から記録媒体99の直上に位置するまでの間は加速移動し、画像形成範囲である記録媒体99の直上を左から右へ等速移動し、記録媒体99の直上から移動範囲の右端に位置するまでの間は減速移動し、右端で折り返して記録媒体99の直上に位置するまでの間は加速移動し、記録媒体99の直上を右から左へ等速移動し、記録媒体99の直上から移動範囲の左端に位置するまでの間は減速移動する。

【0030】プラテン12は、キャリッジ3に対して対向配置されており、キャリッジ3の下方に搬送された記録媒体99を略平坦状に支持するものである。

【0031】インク供給路7はUVインクの色ごとにインクタンク6、6、…からヘッド4、4、…へ通じており、インク供給路7を通じて各インクタンク6から当該インクタンク6に通じているヘッド4へ各色のUVインクが供給される。つまり、何れかのインクタンク6に貯留されたUVインクの色は、インク供給路7を介してそのインクタンク6に通じるヘッド4から吐出されるインク滴の色と同じである。また、インク供給路7は、キャリッジ3の移動に追従できるように、フレキシブルな部材から形成されている。

【0032】また、インク供給路7には複数の変圧ポンプ8、8、…が設けられている。変圧ポンプ8がインクタンク6からそのヘッド4に通じているインク供給路7の内部圧を変更することにより、インクタンク6からヘッド4へのインク供給量が変更される。

【0033】キャリッジ3について詳細に説明する。図2に示すように、ヘッド4、4、…がキャリッジ3に取り付けられており、UV光源5、5、…がキャリッジ3に取り付けられており、更に、各UV光源5を覆うようにカバー9、9、…がキャリッジ3に取り付けられている。従い、キャリッジ3の移動に伴ってヘッド4、4、…は記録媒体99上を走査し、UV光源5、5、…はヘッド4、4、…とともに記録媒体99上を走査する。

【0034】各ヘッド4の下面には複数の吐出口（図示略）が形成されており、複数の吐出口は副走査方向Bに一直列となって配列されている。各ヘッド4の内部にはピエゾ素子といった吐出手段（図示略）が設けられており、吐出手段の作動により各吐出口からインク滴が別個に吐出される。一つのヘッド4からは、数種の色の中の何れかの色のUVインクが吐出される。なお、基本的にヘッド4ごとに異なる色のUVインクのインク滴が吐

出されるが、同じ色のUVインクが二以上のヘッド4から吐出されても良い。

【0035】各UV光源5は、特定の波長領域（例えば、波長250nm）の紫外線を安定した照射エネルギーで発光する紫外線ランプ等から構成される。UV光源5から発する紫外線の波長及び照射強度は、記録媒体99の材質或いはUVインクの種類に応じて適宜設定される。紫外線ランプとしては、LED（light emitting diode）、蛍光灯、高圧水銀ランプ、メタルハライドランプ、高圧水銀スポットランプ、キセノンランプ等を適用可能である。UV光源5は、記録媒体99の材質或いはUVインクの種類に応じて照射する紫外線の波長及び照射エネルギーを変更することができても良い。

【0036】各カバー9は、UV光源5を上から覆っている。カバー9によってUV光源5からの紫外線が遮蔽されて、ヘッド4が紫外線に曝露されないようになっており、逆に記録媒体99はUV光源5からの紫外線に曝露される。副走査方向BにおけるUV光源5の長さは、副走査方向Bにおけるヘッド4の長さより長い、又はほぼ同等である。

【0037】ヘッド4、4、…は、主走査方向Aに一直列となって等間隔に並んでいる。UV光源5、5、…も主走査方向Aに一直列となって等間隔に並んでいる。また、二つのUV光源5、5の間に一つのヘッド4が介在しており、ヘッド4及びUV光源5は交互となって主走査方向Aに配列されている。

【0038】これらヘッド4、4、…とUV光源5、5、…とからなる列において、主走査方向Aの両端はUV光源5となっている。また、ヘッド4とその一方の隣りのUV光源5との距離は、その他方の隣りのUV光源5との距離と等しい。つまり、ヘッド4及びUV光源5は交互に且つ等間隔で一直線状に配列されている。なお、図2において、各ヘッド4に示されている符号は吐出されるインク滴の色を意味するが、色の配列は図2のように限らない。

【0039】キャリッジ3が往動し、復動し又は往復移動している際に各ヘッド4からインク滴が吐出されて記録媒体99に着弾する。その際、当該ヘッド4の隣りのUV光源5が、キャリッジ3の移動に伴って着弾したインク滴の直上に位置した時に、着弾したインクが当該UV光源5からの紫外線に照射されることで硬化する。つまり、プラテン12の上方において記録媒体99に対してインク滴の吐出が行われ、更に、プラテン12の上方において記録媒体99に着弾したインク滴に対して紫外線の照射が行われる。

【0040】次に、チャンバー構造10及び搬送機構11について説明する。図3に示すように、チャンバー構造10は、内部空間を有しこの内部空間内に配置されたキャリッジ3及びプラテン12を包囲する箱体13と、箱体13の内面に設けられている仕切板20、21、2

2、23と、を備える。箱体13は、主走査方向A及び副走査方向Bに対して直角な方向を向いた上面部14及び下面部15と、主走査方向Aを向いた二つの側面部（図示略）と、副走査方向Bを向いた前面部16及び後面部17とからなる略直方体状のものであり、これら面によって内部空間が形成されている。面部16、17にはそれぞれ貫通孔16a、17aが形成されており、貫通孔16aが前面部16において箱体13の内外に通じており、貫通孔17aが後面部17において箱体13の内外に通じており、貫通孔16a、17aは互いに向き合っている。

【0041】仕切板20は、上面部14から箱体13の内部空間へ突出する突条であり、主走査方向Aに長尺となっている。仕切板21は、下面部15から箱体13の内部空間へ突出する突条であり、主走査方向Aに長尺となっている。仕切板20及び仕切板21は、上下方向に互いに向き合って配置されている。仕切板22は、上面部14から箱体13の内部空間へ突出する突条であり、主走査方向Aに長尺となっている。仕切板23は、下面部15から箱体13の内部空間へ突出する突条であり、主走査方向Aに長尺となっている。仕切板22及び仕切板23は、上下方向に互いに向き合って配置されている。

【0042】箱体13の内部空間は、仕切板20、21、22、23によって三つに仕切られている。つまり、箱体13の内部空間は、副走査方向Bの上流側の室13aと、副走査方向Bの下流側の室13cと、室13aと室13cの間の室13bとから構成されている。室13aと室13bは仕切板20、21によって仕切られており、室13bと室13cは仕切板22、23によって仕切られている。

【0043】仕切板20と仕切板21の間には、搬送機構11を構成するニップローラ24、24が配置されている。ニップローラ24、24は互いに向き合って近接して配置されており、主走査方向Aの軸心回りに回転自在となっている。同様に、仕切板20と仕切板21の間には、搬送機構11を構成するニップローラ25、25が配置されている。ニップローラ25、25は互いに向き合って近接して配置されており、主走査方向Aの軸心回りに回転自在となっている。ニップローラ24、24はそれぞれ仕切板20、21に近接しており、ニップローラ25、25は仕切板22、23に近接している。つまり、室13aと室13bに通ずる通過口（仕切板20と仕切板21との間の隙間）はニップローラ24、24によって塞がれており、室13bと室13cに通ずる通過口（仕切板22と仕切板23との間の隙間）はニップローラ25、25によって塞がれている。

【0044】側面視して、一方のニップローラ24と他方のニップローラ24との接点と、一方のニップローラ25と他方のニップローラ25との接点と、貫通孔16

aと、貫通孔17aとは、副走査方向Bにはほぼ一直線状となっている。そして、記録媒体99は、貫通孔16aを通して箱体13内へ挿通しており、仕切板20と仕切板21との間を通して室13bに至り、仕切板22と仕切板23との間を通して室13cに至り、更に、貫通孔17bを通して箱体13外へ出ている。そして、記録媒体99は、仕切板20と仕切板21の間においてニップローラ24、24に挟まれており、仕切板22と仕切板23の間においてニップローラ25、25に挟まれている。ニップローラ24、24、25、25のうちの少なくとも何れか一つが回転することによって記録媒体99は副走査方向Bへ搬送される。

【0045】箱体13内の室13bにプラテン12及びキャリッジ3が配置されている。従い、キャリッジ3は室13b内で主走査方向Aに往復移動することになる。キャリッジ3が室13b内に配置されているから、ヘッド4、4、…及びUV光源5、5、…も室13b内に配置されている。

【0046】プラテン12上に搬送された記録媒体99に向けてヘッド4、4、…がインク滴を吐出するが、各ヘッド4の各吐出口から吐出されるインク滴が記録媒体99に着弾するまでのインク滴の弾道は室13bに存する。勿論、各ヘッド4の各吐出口から吐出されるインク滴が着弾する箇所も室13b内に存し、着弾したインク滴がUV光源5によって照射される箇所も室13b内に存する。

【0047】上記不活性ガス供給手段は、UVインクに対して不活性な不活性ガスを室13b内に供給するものである。不活性ガスとしては、ヘリウムガス、ネオンガス、アルゴンガス、クリプトンガス、窒素ガス、炭酸ガス等がある。これらのガスの他に、UVインクの硬化速度を低減させないようなガス、つまり、光重合開始剤の開始反応で発生するラジカルに対して不活性なガスであれば不活性ガスとして適用可能である。

【0048】不活性ガス供給手段としては、窒素ガスボンベを用いたり、酸素と窒素の中空糸膜に対する透過性の違いを利用し外気中から窒素ガスのみを分離する装置を用いたり、活性炭によるPSA（Pressure Swing Adsorption）方式にて不活性ガスを供給する装置を用いたりする。不活性ガスの供給経路としては、例えば、ヘッド4、4、…とUV光源5、5、…とからなる列の上方において不活性ガスを発生して、UV光源5とヘッド4の間を通してキャリッジ3の下方へ供給する方法がある。以上のようなチャンバー構造10によって室13bは外気から遮断されて、室13b内に不活性ガスが供給されるとチャンバー構造10によって室13bに不活性ガスが閉じ込められて、従って室13bが不活性ガス雰囲気となり、室13b内の酸素濃度が低下する。なお、酸素を吸収する脱酸素剤（酸素除去手段）を室13b内に設けても良い。特に、ヘッド3の下方で記録媒体99

にできる限り近い位置に脱酸素剤を配設するのが望ましく、インク滴が着弾する箇所の近辺に脱酸素剤を配設するのが更に好ましい。基本的に脱酸素剤は、室13bの酸素(O₂)と反応して、室13b内の酸素を除去するものである。脱酸素剤として、鉄粉又はエージレスでも良い。

【0049】次に、上述のように構成されるインクジェットプリンタ1の動作について説明する。インクジェットプリンタ1の動作中において、UV光源5から紫外線が発しており、記録媒体99は紫外線に照射されている。更に、インクジェットプリンタ1の動作中において、不活性ガス供給手段によって室13b内に不活性ガスが供給されて、室13b内の酸素濃度が低下する。この際、不活性ガス供給手段の制御によって、室13b内の酸素濃度は、チャンバー構造10外の雰囲気酸素濃度よりつまり空気酸素濃度(体積濃度約21%)より低下し、具体的には、体積濃度約0.1%~1.0%となっている。

【0050】この状態で、ニップローラ24、24が回転することで記録媒体99は仕切板20と仕切板21の間を通過して、記録媒体99が室13bに搬入されて、更に、ニップローラ25、25が回転することで記録媒体99は仕切板22と仕切板23の間を通過して室13bから搬出される。この際、インクジェットプリンタ1は、ニップローラ24、24、25、25を所定角度ずつ回転することで記録媒体99を副走査方向Bに間欠的に搬送する。ここで、記録媒体99が停止している際に、キャリッジ3が室13b内において主走査方向Aに往動し、復動し又は往復移動する。そして、キャリッジ3が記録媒体99上を移動している最中に、ヘッド4、4、…が適宜各吐出からインク滴を吐出し、インク滴が記録媒体99に着弾する。キャリッジ3が移動することに伴い、着弾したインク滴の直上に当該インク滴を吐出したヘッド4の隣りにあるUV光源5が位置して、このため、このインク滴が紫外線に照射されることで硬化する。

【0051】インクジェットプリンタ1は、以上のように、キャリッジ3の往復移動(又は往動、復動)、インク滴の吐出、着弾したインク滴に対しての照射を行った後に、搬送機構11(つまり、ニップローラ24、24、25、25)で記録媒体99を副走査方向Bに所定距離搬送する。そして、記録媒体99が停止したら、インクジェットプリンタ1は再びキャリッジ3の往復移動(又は往動、復動)、インク滴の吐出、インク滴に対しての照射を行う。以降、インクジェットプリンタ1が上述の動作を繰り返すことにより、記録媒体99上に画像が形成される。

【0052】以上のように本実施形態では、チャンバー構造10の室13bに不活性ガスが供給されるため、室13bの酸素濃度が低下する。ここで、光重合開始剤の

開始反応において発生するラジカルは光重合樹脂のモノマー又はオリゴマーに対してより酸素に対してのほうが反応性が高いため、ラジカルは酸素と反応してしまう。このため着弾したインク滴は硬化阻害を生じるが、本実施形態では、室13b内の酸素濃度が低下しているため、着弾したインク滴は硬化阻害を生じず、UV光源5の紫外線エネルギーを大きくせずともインク滴が確実に硬化する。

【0053】また、室13b内に脱酸素剤が設けられることで、室13b内の酸素が脱酸素剤に吸収されて、室13b内の酸素が脱酸素剤によって除去されて、室13b内の酸素濃度の低下率が非常に良くなる。

【0054】また、仕切板20と仕切板21の間の隙間がニップローラ24、24に塞がれており、仕切板22と仕切板23の間の隙間がニップローラ25、25に塞がれているため、室13b内の不活性ガスが室13b外に漏洩せず、更に、室13b外の酸素が室13b内に漏れ入らない。つまり、室13b内の酸素濃度の上昇が抑えられ、従い、インク滴の硬化阻害が生じない。

【0055】ラジカルと酸素が反応することによってオゾンが発生するが、本実施形態では室13b内の酸素濃度が非常に低いため、ラジカルと酸素が反応せずオゾンが発生しない。そのため、オゾン臭の発生も抑えられる。

【0056】また、UV光源5、5、…の紫外線エネルギーを増大しなくても済むため、インクジェットプリンタ1の消費電力を抑えることができ、更に、UV光源5、5、…を冷却する冷却機構を設ける必要もない。従って、UV光源5、5、…周りが簡素化されて、インクジェットプリンタ1がコンパクトになる。更に、UV光源5、5、…の紫外線エネルギーを増大しなくても済むため、紫外線に対して比較的脆弱な材質も記録媒体99として適用することができる。

【0057】また、ヘッド4、4、…及びUV光源5、5、…が室13b内に配置されているため、インク滴は吐出されてから記録媒体99に着弾して更に紫外線に照射されるまでの間不活性ガス雰囲気のもとに存する。その間に酸素がインク滴に付着せず、インク滴が硬化阻害を生じない。更に、キャリッジ3全体が室13b内に配置されているため、チャンバー構造10周りが簡素化されて、全体としてコンパクトなインクジェットプリンタ1が提供される。

【0058】なお、本発明は、上記実施形態に限定されことなく、本発明の趣旨を逸脱しない範囲において、種々の改良並びに設計の変更を行っても良い。上記実施形態では、UV光源5、5、…がキャリッジ3に設けられていたが、着弾したインク滴に紫外線を照射できるのであれば、キャリッジ3に設けなくても良い。例えば、キャリッジ3より副走査方向Bの下流側において、主走査方向Aの箱体13全幅にわたって延在したUV光源を

プラテン12の上方に設けても良い。この場合も、UV光源は箱体13の室13b内に配設されており、吐出されたインク滴が着弾した後に記録媒体99が副走査方向Bに搬送されている際に、そのインク滴はUV光源下を通過している時に紫外線に照射される。

【0059】また、上記実施形態ではヘッド4、4、…がキャリッジ3に設けられて主走査方向Aに往復移動するが、移動しない所謂ラインヘッドをヘッド4、4、…及びキャリッジ3、3、…に代えて設けても良い。この場合は、図4のようになる。

【0060】つまり、室13b内において、プラテン12の上方にラインヘッド30が固定されている。ラインヘッド30の下面には吐出口32、32、…が主走査方向Aに一列となって形成されており、吐出口33、33、…が主走査方向Aに一列となってラインヘッド30の下面に形成されており、吐出口34、34、…が主走査方向Aに一列となってラインヘッド30の下面に形成されており、吐出口35、35、…が主走査方向Aに一列となってラインヘッド30の下面に形成されている。吐出口32、32、…の列、吐出口33、33、…の列、吐出口34、34、…の列及び吐出口35、35、…の列は、主走査方向Aの室13bの全幅にわたっている。

【0061】吐出口32、32、…から吐出されるUVインクの色は全て同じであり、同様に、吐出口33、33、…から吐出されるUVインクの色は全て同じであり、吐出口34、34、…から吐出されるUVインクの色は全て同じであり、吐出口35、35、…から吐出されるUVインクの色は全て同じである。但し、吐出口32、33、34、35から吐出されるUVインクの色は互いに異なり、例えば、各吐出口32からはイエローのUVインクが吐出され、各吐出口33からはマゼンタのUVインクが吐出され、各吐出口34からはシアンのUVインクが吐出され、各吐出口35からはブラックのUVインクが吐出される。更に、その他の色のUVインクを吐出するのであれば、主走査方向Aに一列となって配列された複数の吐出口をラインヘッド30の下面に設ければ良い。

【0062】図4のようなインクジェットプリンタの場合、ラインヘッド30より副走査方向Bの下流側において、主走査方向Aの箱体13全幅にわたって延在したUV光源31をプラテン12の上方に設ける。ラインヘッド30及びUV光源31は、室13b内に配設されている。そして、ラインヘッド30から吐出されて記録媒体99に着弾したインク滴は、記録媒体99が副走査方向Bに搬送されている際にUV光源31下を通過している時に紫外線に照射される。図4のようなインクジェットプリンタにおいても、不活性ガス供給手段によって室13b内に不活性ガスが供給されているため、チャンバー構造10によって室13bに不活性ガスが閉じ込められ

て、従って室13bが不活性ガス雰囲気となり、室13b内の酸素濃度が低下する。記録媒体99に着弾したインク滴は硬化阻害を生じない。図4のようなインクジェットプリンタの場合でも、脱酸素剤を室13b内に配設するのが良い。

【0063】ところで、図4のようなインクジェットプリンタにおいて、室13bを更に二つに仕切っても良い。つまり、UV光源31が内部に存する室と、ラインヘッド30が内部に存する室とに、室13bを仕切っても良いが、この場合、主にUV光源31が内部に存する室だけを不活性ガス雰囲気下にしても良いし、UV光源31が内部に存する室及びラインヘッド30が内部に存する室の両方を不活性ガス雰囲気下にしても良い。なお、図4(a)は、主走査方向Aに見て示した部分断面図であり、図4(b)は、図4(a)の破断線D-Dで破断して示した断面図であり、図4のインクジェットプリンタについては、図1～図3に図示したインクジェットプリンタ1と同様の構成要素に同様の符号を付してその説明を省略し、更に図4(b)においてプラテン12及び記録媒体99の図示を省略する。

【0064】また、封止手段としての箱体13はインク滴の着弾箇所に不活性ガスを完全に封止できなくとも良く、封止作用のある遮蔽体等の種々のものを箱体13に代えて設けても良いし、外気がインク滴の着弾箇所に入らないように遮断するものを箱体13に代えて設けても良い。例えば、ラインヘッド30並びにUV光源31又はキャリッジ3がチャンバー構造10内に配置されている構造としたが、必ずしもチャンバー構造10を設けなくとも良く、その代わりに、例えば、窒素等といった不活性ガスによる所謂エアカーテンでラインヘッド30並びにUV光源31又はキャリッジ3を包囲する。その場合、エアカーテンの不活性ガスがエアカーテンに包囲された空間内部に供給されて、エアカーテンにより不活性ガスがその空間に閉じ込められて、ラインヘッド30並びにUV光源31又はキャリッジ3の下方に搬送された記録媒体99の周囲の酸素濃度が低減し、記録媒体99に着弾したインク滴は硬化阻害を生じない。

【0065】つまり、ラインヘッド30又はヘッド4から吐出されたインク滴が記録媒体に着弾してUV光源5又はUV光源31によって紫外線に照射されるまでの間、外気から遮断されて、外気から遮断された空間に不活性ガス雰囲気が供給されれば良い。従い、UV光源5又はUV光源31が室13b内に配置されているのが望ましいが、必ずしも室13b内に配置されている必要はない。UV光源5又はUV光源31が室13b内に配置されていない場合には、箱体13は紫外線の透過性を有する材質であることは勿論である。

【0066】また、図5に示すようなキャリッジ103を具備するインクジェットプリンタであっても良い。図5に示すキャリッジ103は、上記キャリッジ3に代え

てインクジェットプリンタ1に設けられるものであり、このキャリッジ103を具備したインクジェットプリンタ1には上記チャンバー構造10が設けられていないが、記録媒体99を副走査方向に間欠的に搬送する搬送機構が設けられている。

【0067】図5に示すように、キャリッジ103は、上記キャリッジ3と同様に、間欠的な記録媒体99の搬送に合わせて、プラテン12の上方においてガイド部材2に沿って主走査方向Aに往復移動するものであり、具体的には記録媒体99が停止している際に主走査方向Aに往動、復動又は往復移動をするものである。

【0068】キャリッジ103には、ヘッド104、4、…が取り付けられており、UV光源105、105、…も取り付けられており、各UV光源105を覆うようにカバー109、109、…もキャリッジ103に取り付けられている。ヘッド104は、上記ヘッド4と同様に副走査方向Bに一列となつて配列された複数の吐出口を下面に具備し、吐出口からインク滴が吐出される。UV光源105も上記UV光源5と同様のものであり、カバー109も上記カバー9と同様のものであるため、詳細な説明を省略する。

【0069】ヘッド104、104、…は、主走査方向Aに一列となつて等間隔に並んでいる。UV光源105、105、…も主走査方向Aに一列となつて等間隔に並んでいる。また、二つのUV光源105、105の間に一つのヘッド104が介在しており、ヘッド104及びUV光源105は交互となつて主走査方向Aに配列されている。ヘッド104及びUV光源105は交互に且つ等間隔で一直線状に配列されている。

【0070】キャリッジ103は、下方に開口した箱状に形成されている。つまり、キャリッジ103は、前面部103a、後面部103b、側面部103c、側面部103d及び上面部103eから構成される箱体を具備している。そして、この箱体内にヘッド104、104、…、UV光源105、105、…及びカバー109、109、…が設けられている。そして、前面部103a、後面部103b、側面部103c及び側面部103dの下端にカーテン部材120が取り付けられている。カーテン部材120は、下方から見ると、圍繞するように設けられている。そして、カーテン部材120は前面部103a、後面部103b、側面部103c及び側面部103dの下端から垂れ下がっている。そして、カーテン部材120は、記録媒体99に軽く接した状態か或いは記録媒体99に対して微小の隙間があいた状態となっている。従つて、キャリッジ103の箱体、カーテン部材120及び記録媒体99に包囲された内部空間があり、この内部空間においてインク滴がヘッド104、104、104から吐出されて、この内部空間においてインク滴が記録媒体99に着弾する。

【0071】キャリッジ103を具備したインクジェッ

トプリンタも、不活性ガス供給手段(図示略)を具備している。この不活性ガス供給手段は、供給路121を通じてキャリッジ103の箱体内に不活性ガスを供給するものである。従つて、キャリッジ103の箱体、カーテン部材120及び記録媒体99に包囲された内部空間に不活性ガスが閉じ込められて、この内部空間が不活性ガス雰囲気となり、この内部空間の酸素濃度が低下する。従つて、記録媒体99に着弾したインク滴は硬化阻害を生じない。そして、キャリッジ103の箱体内に脱酸素剤が設けられていれば、更に、内部空間の酸素濃度低下効率が非常に良くなる。

【0072】なお、カーテン部材120の代わりに、ブラシ状の部材、布製の部材、綿製の部材、薄くて軟質の樹脂シート状の部材であっても良い。また、図5(a)において、各ヘッド104に示されている符号は吐出されるインク滴の色を意味するが、色の配列は図5(a)のように限らない。

【0073】ところで、図3又は図4のインクジェットプリンタが、不活性ガス供給手段を具備しているが、室13b内に脱酸素剤が配設されている場合には、不活性ガス供給手段を具備していなくても良い。但し、脱酸素剤により室13b内の酸素濃度が十分に低くならない場合(例えば、室13b内の酸素濃度が体積濃度約10%以上である場合)、不活性ガス供給手段をインクジェットプリンタに設けるのが望ましい。図5のインクジェットプリンタの場合も同様に、キャリッジ103の箱体内に脱酸素剤が配設されている場合には、不活性ガス供給手段をインクジェットプリンタに設けなくても良い。

【0074】

【発明の効果】本発明によれば、記録媒体に着弾したインク滴は、周辺雰囲気酸素濃度が低下した状態で紫外線に照射されるから、着弾したインク滴は、酸素によって硬化阻害を生じず、紫外線エネルギーを大きくせずとも記録媒体上で確実に硬化する。従つて、インク滴が記録媒体上で滲まず、インク滴の径が大きくなならないから高精細な画像が記録媒体に形成される。特に、記録媒体が樹脂フィルムといったインク滴が広がりやすい材質であっても、インク滴が確実に硬化するからこのような材質の記録媒体に対しても安定して高精細な画像形成を行える。また、記録媒体に着弾したインク滴の周囲の酸素濃度が非常に低いため、ラジカルと酸素との反応が生じずオゾンが発生しない。ゆえに、オゾン臭の発生も抑えることができる。また、紫外線エネルギーを大きくせずとも活性光硬化性インクが確実に硬化するため、紫外線で劣化しやすい材質の記録媒体に画像形成することもできる。

【図面の簡単な説明】

【図1】図1は、本発明が適用されたインクジェットプリンタの要部を示した斜視図である。

【図2】図2は、上記インクジェットプリンタに備わる

キャリッジを概略的に示した下面図である。

【図3】図3は、上記キャリッジが収められたチャンバー構造を側方から見て示した断面図である。

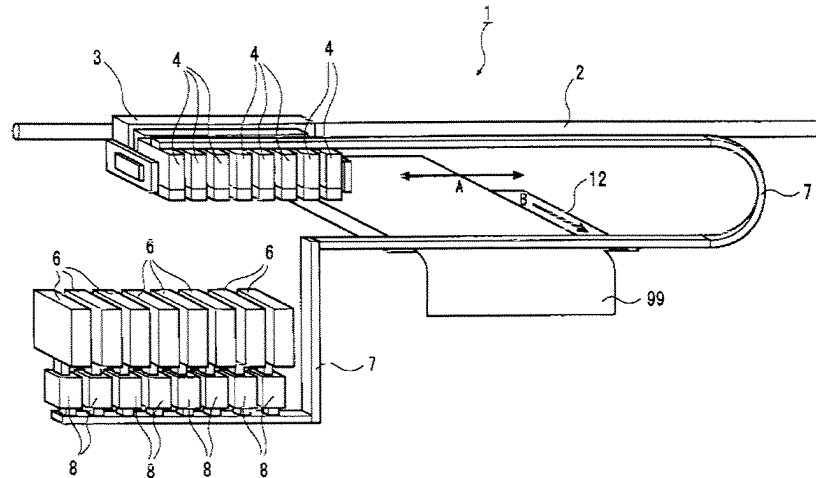
【図4】図4 (a) は、上記インクジェットプリンタとは別例のインクジェットプリンタに備わるチャンバー構造を側方から見て示した断面図であり、図4 (b) は、このチャンバー構造を下方から見て示した断面図である。

【図5】図5 (a) は、上記インクジェットプリンタとは別例のインクジェットプリンタに備わるキャリッジを概略的に示した下面図であり、図5 (b) は、このキャリッジを記録媒体とともに示した斜視図である。

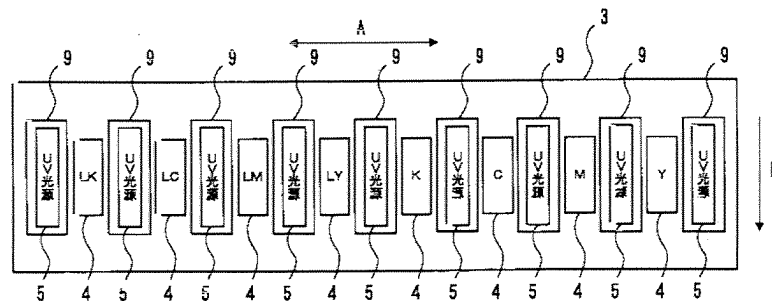
【符号の説明】

- 1 インクジェットプリンタ
- 4、104 ヘッド
- 5、31、105、106 UV光源 (照射手段)
- 10、110 チャンバー構造 (封止手段、包囲体)
- 11 搬送機構
- 13、113 箱体
- 13b 室
- 20、21、22、23 仕切板
- 24、25 ニップローラ (ローラ)
- 30 ラインヘッド (ヘッド)
- 103 キャリッジ (封止手段、包囲体)
- 120 カーテン部材 (封止手段、包囲体)

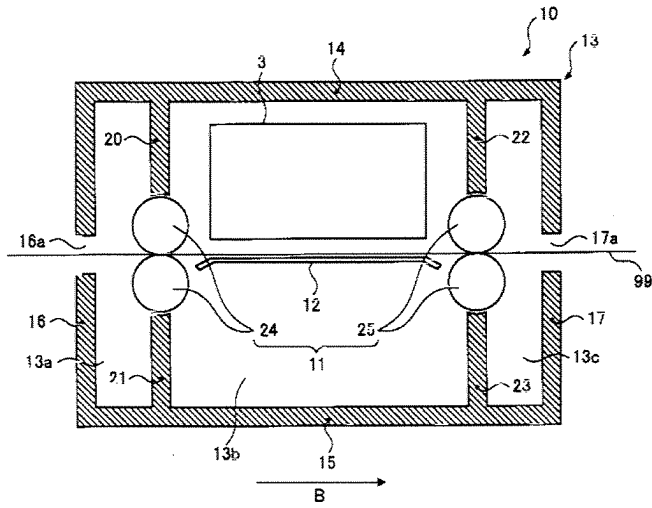
【図1】



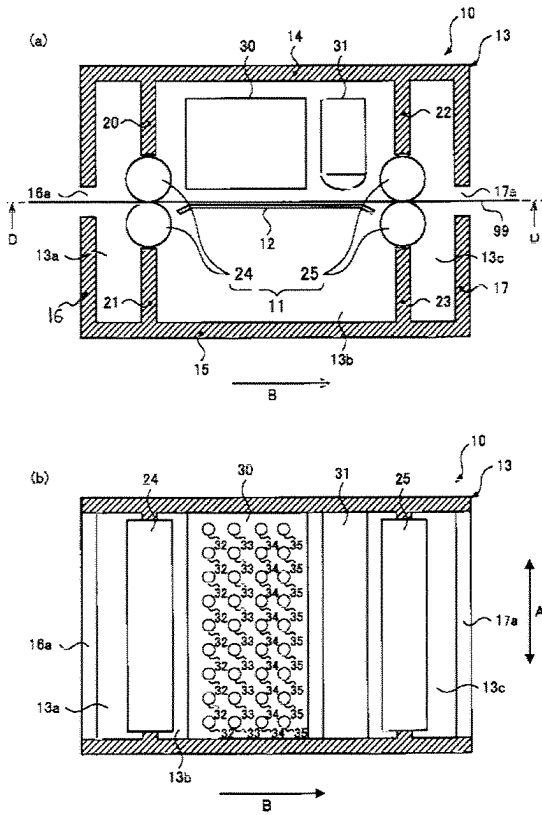
【図2】



【図3】



【図4】



【図5】

